

BIM Collaboration with Autodesk Navisworks: Part of the Aubin

**Darryl McClelland
Paul Aubin**



The Aubin Academy Master Series:

BIM Collaboration with Autodesk

Navisworks

Covers version 2015

Paul F Aubin

Darryl McClelland, LEED AP BD + C

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The Aubin Academy Master Series: BIM Collaboration with Autodesk Navisworks

Paul F. Aubin and Darryl McClelland, LEED AP BD +C

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Section I

Preface and Introduction

WHAT’S IN THIS SECTION?

If you are new to the concept of BIM (Building Information Modeling) and DIM (Design Intent Modeling) you’ve come to the right place. In this section we will begin our exploration of BIM Collaboration by introducing the concept of BIM and outlining how the book is structured. This section begins with the Preface which has important information about how the book is structured and our approach to covering the subject of learning BIM Collaboration with Navisworks. Chapter 1 discusses BIM and DIM from a high level to help you understand these key concepts and how they fit into the work being done in the building industry today. This section is brief. Performing at least a quick cursory view of its contents will help you in using this book to its fullest intended value.

SECTION I IS ORGANIZED AS FOLLOWS:

-

Preface

-

[Chapter 1 Building Information Modeling](#)



Preface

WELCOME

In this book you will find a detailed introduction to the philosophy and methodology of the Navisworks software product. Navisworks is an advanced and a powerful model aggregator giving the project stakeholders the ability to review their project and identify any construction related issues before they become costly to correct in the field and/or potentially delay the project. Navisworks allows files from many different product platforms to be merged into a single Navisworks file creating an overall model useful for coordination and review.

Currently, there are three different “flavors” of Navisworks. There is Navisworks Freedom, Navisworks Simulate, and Navisworks Manage. Navisworks Freedom is a free viewer that allows the project stakeholders the ability to view and interact with a Navisworks model. There is limited functionality with Navisworks Freedom. Navisworks Simulate incorporates all the features of Navisworks Freedom and adds schedule, cost, animation, and visualization to the product to allow the project team to review the overall project design and simulate construction of the building project. Simulate also provides several tools for mark-up to facilitate design team collaboration. However, Navisworks Simulate does not allow you to perform a clash analysis of your project model. Finally, Navisworks Manage incorporates all the features of Navisworks Freedom and Simulate and adds clash detection capabilities.

After following the tutorials contained in this book, you will have an understanding of Navisworks, its workings and its overall functionality. There are two basic goals of this book: (1) Help shorten the learning curve for Navisworks; and (2) Help you develop sound methods and procedures for using the Navisworks product. To begin building your success with the Navisworks product you need to develop a broad knowledge base on how the

program functions and have a clear understanding of what the program can and cannot do.

This is what *BIM Collaboration with Autodesk Navisworks* is all about.

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WHO SHOULD READ THIS BOOK?

The audience of this book is new users to Navisworks and those existing Navisworks users who wish to expand their knowledge. No prior Navisworks software knowledge is required.

If part of your job requires that you coordinate the design of buildings and their system components then this book is intended for you. This includes architects, engineers, construction professionals, and others in, or relating to, the AEC field.

You do not need to be an expert computer operator to use this book, but basic knowledge of the Windows OS (Operating System), basic use of a mouse and keyboard are assumed.

WHAT YOU WILL FIND INSIDE

[Section I](#) of the book discusses Building Information Modeling (BIM) and Design Intent Modeling (DIM) and how Navisworks might play a role in each of those processes. [Section](#)

[II](#) discusses the basic fundamentals of all three (3) Navisworks products: Freedom, Simulate, and Manage. Topics include the Navisworks user interface, global settings and file options,

Navisworks files and their management, and navigation with the model. [Section II](#) is intended to get you acquainted with the software and put you in the proper mindset. [Section](#)

[III](#) begins to rely heavily on tutorial-based exercises centered on the analysis of the Navisworks project model. Exercise work will be performed in a small commercial office

building model and clash detection and the 4D simulation of a building project. Detailed

explanations are included throughout the tutorials to identify clearly why each step is

employed. [Section IV](#) reviews the visualization tools in Navisworks including the creation and automation of Animations. Many chapters also include a Quick Reference at the end of

the chapter that you can use for reference in your day-to-day work.

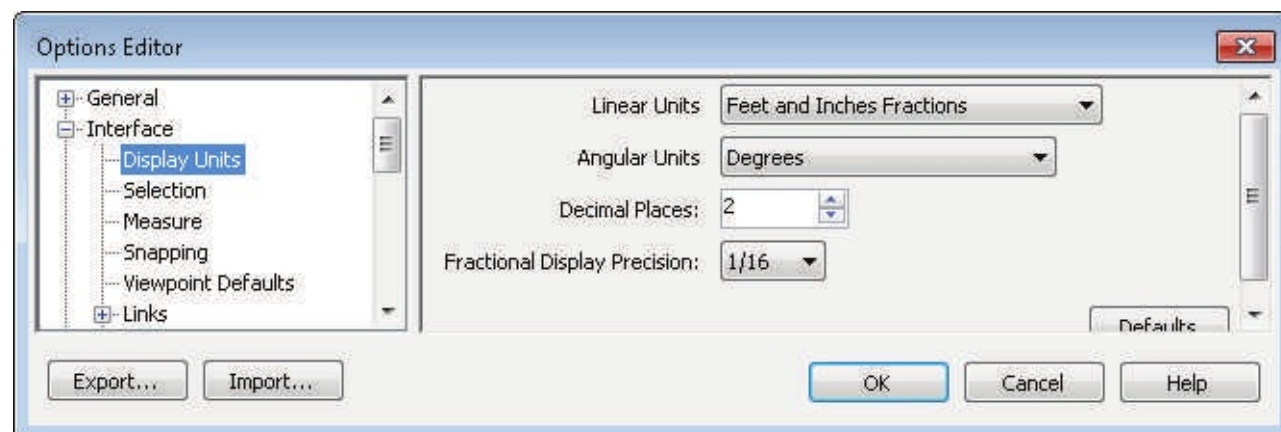
Navisworks is not an extremely complex product. However, a few of the tools can be intimidating until you get familiar with them. This book is written to help remove some of that fear when seeing the tools within the product for the first time. With a little investment

or your time you should be well on your way to mastering Navisworks.

WHAT YOU WON'T FIND INSIDE

This book is not a command reference. This book approaches the subject of learning Navisworks by exposing conceptual aspects of the software through tutorial coverage. No attempt is made to give a comprehensive explanation of every command and/or process or

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every method available to execute commands and/or processes as workflows vary from firm to firm. Instead, explanations cover broad topics on how to perform various tasks in Navisworks with specific examples coming from actual practice. References are made within the text wherever appropriate to the Navisworks Help and reference materials available on the Web. The focus of this book is methodology of the tools in Navisworks while focusing on overall project coordination.

STYLE CONVENTIONS

Style Conventions used in this text are as follows:

Text

Navisworks

Step-by-Step Tutorials

1. Perform these steps.

Menu picks

Application Menu > Save As

Dialog box and palette input

For the set name, type: **Column**.

File and Directory Names

C:\BIM Collaboration 1ed\Chapter01\Sample Project.nwc

UNITS

This book is written in Imperial units. For clarity, dimensions throughout this book appear in a “Feet and Inches Fraction” format. To follow along with the text you are encouraged to set your Display Units, through the Options Editor, to the Imperial units (see [Figure P.1](#)).

FIGURE P.1.1

Set your Display Units

Note: The text and the features and functionality described herein are based on the Navisworks Manage product. Some of the features and functionality described may not be available in either the Navisworks Freedom or the Navisworks Simulate products.

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HOW TO USE THIS BOOK

The order of chapters has been carefully considered with the intention of following a logical flow. If you are relatively new to Navisworks, it is recommended that you complete the book from beginning to end. If certain chapters do not pertain to the type of work that you or your firm performs, or even the product that you own (Freedom, Simulate, or Manage),

please feel free to skip individual topics. Please keep in mind that not every procedure will be repeated in every chapter. For example, many procedures in Navisworks are common across

all three products, and even though you might not have one of the other products, you might find valuable tips or techniques in the chapters devoted to the other products. Therefore, for the best experience, you are encouraged to read the entire book. Most importantly, even after

you have completed your initial pass of the tutorials in this book; keep *BIM Collaboration with Autodesk Navisworks* handy as it will remain a valuable desk resource in the weeks and months to come.

COMPUTER HARDWARE AND OPERATING SYSTEMS

Since movement through the project model is one important component in project coordination within the Navisworks products, the user experience can be greatly enhanced by reducing the “drop out” in the Navisworks product. Autodesk defines drop out in the Navisworks product as:

“In order to maintain interactivity and guarantee a user-defined frame rate, Autodesk Navisworks only renders what it can in the fraction of a second that it has. The remainder is “dropped out”, or not rendered.

Autodesk Navisworks prioritizes what is rendered and what is dropped out based on size of the item’s bounding box, distance from viewer and size on screen, so only the less significant items in the scene are dropped out.”

Since Navisworks is a CPU (Central Processing Unit) intensive program in lieu of a GPU (Graphics Processing Unit) program, it is recommend that a minimum of two (2) processing cores with a high clock speed be utilized with 8 GB of RAM (Random Access Memory).

Additional RAM might not have significant impact on your project model(s) performance and the authors encourage you to create a “test environment” to determine the optimal configuration for Navisworks based on your company’s system and network configurations.

Most systems today have multi-core processors. This essentially means the system has two, four, or more processors working in tandem on the same chip. In order to take advantage of

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such a configuration, an application must be “multi-threaded,” which means that it can actually make use of all processor cores. An application that is not multi-threaded will only make use of a single core. Navisworks can take advantage of multiple cores when they are

available. Also, since most people run several applications simultaneously multi-core machines can offer other performance benefits as well. For example, many other programs can also utilize all cores simultaneously, or the load of several applications can be spread among the various cores.

While still prevalent, the amount of RAM that the OS can address is limited on a 32 bit OS.

Depending on your current configuration, this will be between 3 and 4 gigabytes, at a maximum. However, 64 bit hardware and OS are more popular due to the demands of programs, like Navisworks, and this hardware is available from many manufacturers.

Microsoft Windows XP, Vista and Windows 7 and Windows 8 come in 64 bit editions.

The 64 bit version of Navisworks is functionally the same as the 32 bit version. Users will notice no difference in the interface or function of the product. The primary benefit of the 64 bit version is its ability to access significantly more memory than 32 bit version. Many users of 64 bit OS have computers with 8 or 16 gigs of RAM or more, but it can go much higher (128 GB in Vista and 192 GB in Windows 7).

Using 64 bit and having more RAM in your system will give you the following benefits:

You are able to open project model faster.

More physical RAM reduces the amount of hard disk swapping required.

BOOK DATASET FILES

Files used in the tutorials throughout this book are available for download from

www.paulaubin.com. Most chapters include files required to begin the lesson, and in a few cases a completed version of the file might be provided as well to help you check your

work. This allows you load the files for a given chapter and begin working by following the step-by-step instructions in the chapter. When you install the downloaded dataset, the files

for *all* chapters are installed automatically. The files will install into a folder on your C: drive named: *BIM Collaboration 1ed*. You are encouraged to install files in this location. Inside this folder will be a folder for each chapter. In some cases, a particular chapter, or subfolder, will not contain any dataset files. For example, the *Chapter01* folder might not contain any

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dataset files but instead it contains a text file named *There is no Dataset for Chapter 1.txt*. This text file simply explains that this folder was left empty intentional y.

Should updates to the dataset occur, a notice will be posted to www.paulaubin.com/blog.

You are encouraged to check this website frequently.

Note: Please note that the accompanying dataset *only* contains the appropriate files, and other related resource files, necessary to complete the tutorial lessons in this book. The

provided dataset does *not* contain the Navisworks software. Please contact your local

Autodesk reseller if you need to purchase either of these products.

To download and install the files, please do the following:

1. In your web browser, visit: www.paulaubin.com.
2. Click on the Books link at the top.
3. Click on the link for the book whose files you wish to access.

Downloads will be listed in the “Downloads” section of the page.

4. There may be more than one item to download. Click each item and follow the instructions of your browser to download each one.

5. Run the WinZip EXE file and unzip the files to your C Drive.

The default unzip folder is named *C:\BIM Collaboration 1ed* on your hard drive. Unzipped files will utilize approximately 30 MB of disk space.

IMPORTANT

Please install the dataset files in the default C:\ drive location, if at all possible. Exercises herein will reference the files located there.

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TEST YOUR SKILLS WITH KNOWLEDGESMART FOR FREE!

The authors of the Aubin Academy Series would like to thank

KnowledgeSmart, L.L.C. for their support and partnership by allowing us

to extend the Navisworks learning process to online electronic skills

assessments to all the readers who have purchased this book. At the

end of this book, you will be provided additional information on how to

log-in to the KnowledgeSmart website in order to assess your knowledge

based on what you learned about Navisworks herein. If you would like to

learn more about KnowledgeSmart please visit their website at:

www.knowledgesmart.net

KEEP YOUR SOFTWARE CURRENT

It is important to keep your software current. Be sure to check online at

www.autodesk.com on a regular basis for the latest updates and service packs for the Navisworks software. Having the latest version installed will ensure that you benefit from the

latest features and enhancements. If you are on the Autodesk Subscription program, you will

be entitled to new releases as they become available. Visit the Autodesk web site or talk to

your local reseller for more information.

WE WANT TO HEAR FROM YOU

We welcome your comments and suggestions regarding *BIM Collaboration with Autodesk*

Navisworks. You can send emails directly to the authors at: navis@paulaubin.com. Visit

www.paulaubin.com to learn more about our books and other offerings.

ABOUT THE AUTHORS

Paul F. Aubin is the author of many CAD and BIM book titles including the widely acclaimed: The Aubin Academy Mastering Series. His latest book: Renaissance Revit takes a deep dive into the Revit Family Editor. Paul has also authored several video training courses for lynda.com (www.lynda.com/paulaubin). He is an independent architectural consultant who travels internationally providing implementation, training, and support services. Paul's involvement in the architectural profession spans over 25 years, with experience that includes design, production, CAD management, mentoring, coaching and training. He is an active member of the Autodesk user community, and has been a top-rated speaker at Autodesk University for many years. Paul is also a frequent speaker at the Revit

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Technology Conference (RTC) in both the US and Australia, the BIM Workshops and Minnesota University. His diverse experience in architectural firms, as a CAD manager, and as an educator gives his writing and his classroom instruction a fresh and credible focus. Paul is an associate member of the American Institute of Architects. He lives in Chicago with his wife and three children.

Darryl McClelland, LEED AP has 27 years of practical design experience in MEP engineering. Although his primary focus was the design of mechanical systems, he spent 11 of those 27 years designing electrical and plumbing systems as well. He also ran his own engineering business for eight years. His design experience ranges from complex research laboratories and institutional facilities to medical and professional office buildings, and everything in between. He is a graduate of Purdue University and an active member of

ASHRAE, ASPE, and a LEED AP.

DEDICATION

Paul's dedication: This book is dedicated to my wife and children. Thank you for your boundless love and support.

Darryl's dedication: This book is dedicated to Anne Marie and Bryan. Thank you for all your support and love all these years. I would not be where I am today without it.

ACKNOWLEDGMENTS

Both authors would like to acknowledge the countless number of individuals that have supported us both personally and professionally. Those individuals always took the time to share their knowledge, insight, and most importantly helped guide us through the Building Information Modeling revolution that has taken hold in the AEC industry. There are far too many of you to name herein but rest assured if our paths have crossed at one point in time in this venture you know exactly who you are and the contribution that you made to our efforts. For that we are humbled and very grateful for your support.

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Author Illustrations: Ron Bailey

Cover Artwork: iStockphoto.com

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Chapter 1

Building Information Modeling

INTRODUCTION

Navisworks aggregates Building Information Models. Building Information Models are created from object-based software packages utilized by architects, engineers, and construction professionals, as well. Certain software products help facilitate the creation of a BIM (Building Information Model) in which plans, sections, elevations, 3D models, quantities, and other data are fully coordinated and can be readily manipulated, accessed, and shared. From the BIM database, one can perform design tasks, query quantities and takeoffs, and generate drawing sheets for construction documentation needs. There are several advantages of this approach. From a production point of view, it means less time for drafting and coordinating building data, because all drawings and reports come from the same data source. If a portion of the model changes, all Views, whether floor plans, sections, elevations, or schedules will reflect that change immediately.

OBJECTIVES

In this chapter, we will briefly discuss Building Information Modeling.

BUILDING INFORMATION MODELING

In the Autodesk Revit Curriculum & Student Workbook, author Simon Greenwold concisely and elegantly presents the concept of Building Information Modeling (BIM). A portion of that text is reproduced here to help explain BIM and how it compares to more traditional computer aided design (or drafting) (CAD) technology. The following topic is excerpted from the above-mentioned publication which is © 2005 Autodesk, Inc. It is used here with permission.

Editor's Note: While this essay is now several years old, it deals with the concept of BIM

from the “high level.” As such, the points discussed remain relevant to BIM today even as the specifics of BIM continue to evolve each year.

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Building Information Modeling [BIM] is a process that fundamentally changes the role of computation [and delineation] in architectural design. It means that rather than using a computer to help produce a series of drawings and schedules that together describe a building, you use the computer to produce a single, unified representation of the building so complete that it can generate all necessary documentation. The primitives from which you compose these models are not the same ones used in CAD (points, lines, curves). Instead you model with building components such as walls, doors, windows, ceilings, and roofs. The software you use to do this recognizes the form and behavior of these components, so it can ease much of the tedium of their manipulation. Walls, for instance, join and miter automatically, connecting structure layers to structure layers, and finish layers to finish layers.

Many of the advantages are obvious—for instance, changes made in elevation propagate automatically to every plan, section, callout, and rendering of the project. Other advantages are subtler and take some investigation to discover. The manipulation of parametric relationships to model coarsely and then refine is a technique that has more than one career’s worth of depth to plumb.

BIM design marks a fundamental advance in computer-aided design. As the tools improve, ideas spread, and [practitioners] become versed in the principles, it is inevitable that just as traditional CAD has secured a deserved place in every office, so will BIM design.

CAD versus Building Information Modeling

Modeling Is Not CAD—BIM is entirely unlike the CAD tools that emerged over the last 50 years and are still in wide use in today’s architectural profession. BIM methodologies, motivations, and principles represent a shift away from the kind of assisted drafting systems that CAD offers.

To arrive at a working definition of Building Information Modeling first requires an examination of the basic principles and assumptions behind this type of tool.

Why Draw Anything Twice? —You draw things multiple times for a variety of reasons. In the process of design refinement, you may want to use an old design as a template for a new one. You are always

required to draw things multiple times to see them in different representations. Drawing a door in plan does not automatically place a door in your section. So the traditional CAD program requires that you draw the same door several times.

Why Not Draw Anything Twice?—There is more to the idea of not drawing anything than just saving time in your initial work of design representation. Suppose you have drawn a door in plan and have added that same door in two sections and one elevation. Now should you decide to move

that door, you suddenly need to find every other representation of that door and change its location too. In a complicated set of drawings, the likelihood that you can find all the instances of that door the first time is slim unless you are using a good reference tracking system.

Reference and Representation—But doesn't reference tracking sound like something a computer ought to be good at? In fact, that's one of about three fundamental things a computer does at all.

And it is exceedingly good at it. The basic principle of BIM design is that you are designing not by describing the forms of objects in a specific representation, but by placing a reference to an object into a holistic model. When you place a door into your plan, it automatically appears in any section or elevation or other plan in which it ought to be visible. When you move it, all these views update because there is only one instance of that door in the model. But there may be many

representations of it.

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You Are Not Making Drawings—That means that as you create a model in modeling software, you are not making a drawing. You are asked to specify only as much geometry as is necessary to locate and describe the building components you place into the model. For instance, once a wall exists, to place a door into it, you need to specify only the type of door it is (which automatically determines all its internal geometry) and how far along the wall it is to be placed. That same information places a door in as many drawings as there are. No further specification work is required.

That means that the act of placing a door into a model is not at all like drawing a door in plan or elevation, or even modeling it in 3D. You make no solids, draw no lines. You simply choose the type of door from a list and select the location in a wall. You don't draw it. A drawing is an artifact that can be automatically generated from the superior description you are making.

Even More Than a 3D Model—You are making a model—a full description of a building. This should not be confused with making a full three-dimensional (3D) model of a building. A 3D model is just

another representation of a building model with the same incompleteness as a plan or

section. A full 3D model can be cut to reveal the basic outlines for sections and plans, but there are drawing conventions in these representations that cannot be captured this way. How will a door

swing be encoded into a 3D model? For a system to intelligently place a door swing into a plan but not into a 3D model, you need a high-level description of the building model separate from a 3D

description of its form. This is the model in BIM design.

Encoding of Design Intent—This model encodes more than form; it encodes high-level design intent. A staircase is modeled not as a rising series of 3D solids, but as a staircase. That way if a level changes height, the stair automatically adjusts to the new criterion.

Specification of Relationships and Behavior—When a design changes, BIM software attempts

to maintain design intent. The model implicitly encodes the behavior necessary to keep all

relationships relative as the design evolves. Therefore the modeler is required to specify enough information that the system can apply the best changes to maintain design intent. When you move

an object, it is placed at a location relative to specific data (often a floor level). When this [datum]

moves, the object moves with it. This kind of relativity information is not necessary to add to CAD models, which are brittle to change.

Objects and Parameters—You may be troubled by the idea that the only doors you are allowed to place into a wall are the ones that appear on a predefined list. Doesn't this limit the range of possible doors? To allow variability in objects, they are created with a set of parameters that can take on arbitrary values. If you want to create a door that is nine feet high, it is only necessary to modify the height parameter of an existing door. Every object has parameters—doors, windows,

walls, ceilings, roofs, floors, even drawings themselves. Some have fixed values, and some are modifiable. In advanced modeling you will also learn how to create custom object types with parameters of your choosing.

How Do BIM Tools Differ from CAD Tools?

Clearly, because modeling is different from CAD, you are obliged to learn and use different tools.

Modeling tools don't offer such low-level geometry options—As a general rule modeling deals with higher-level operations than CAD does. You are placing and modifying entire objects rather

than drawing and modifying sets of lines and points. Occasionally you must do this in BIM, but not frequently. Consequently, the geometry is generated from the model and is therefore not open to

direct manipulation.

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Modeling tools are frustrating to people who really need CAD tools—For users who are not

skilled modelers, modeling can feel like a loss of control. This is much the same argument stick-shift car drivers make about control and feel for the road. But automatic transmission lets you eat a sandwich and drive, so the choice is yours. There are also ways to layer on low-level geometric

control as a post-modeling operation, so you can regain control without destroying all the benefits of a full building model.

Modeling entails a great deal of domain-specific knowledge—Many of the operations in the

creation of a Building Information Model have semantic content that comes directly from the

architectural domain. The list of default door types is taken from a survey of the field. Whereas CAD

gets its power from being entirely syntactical and agnostic to design intent, BIM design is the

opposite. When you place a component in a model, you must tell the model what it is, not what it looks like.

Or else requires you to build it in yourself—Adding custom features and components to a BIM

design is possible but requires more effort to specify than it does in CAD. Not only must geometry be specified, but also the meanings and relationships inherent in the geometry.

Is Modeling Always Better Than CAD?

As in anything, there are trade-offs.

A model requires much more information—A model comprises a great deal more information

than CAD drafting. This information must come from somewhere. As you work in a modeling tool, it makes a huge number of simplifying assumptions to add all the necessary model information. For

instance, as you lay down walls, they are all initially the same height. You can change these default values before object creation or later, but there are a near infinitude of parameters and possible values, so the program makes a great many assumptions as you work. The same thing happens

when ever you read a sketch, in fact. That sketch does not contain enough information to fully

determine a building. The viewer fills in the rest according to tacit assumptions.

Flouting of convention makes for tough modeling—This method works well when the building

being modeled accords reasonably well with the assumptions the modeler is making. For instance, if the modeler makes an assumption that walls do not cant in or out but instead go straight up and down, that means that vertical angle does not need to be specified at the time of modeling. But if the designer wants tilted walls, it's going to require more work—potentially more work than it would to create these forms in a CAD program. It is even possible that the internal model that the software maintains does not have the flexibility to represent what the designer has in mind. Tilted walls may not even be representable in this piece of software. Then a workaround is required that is a compromise at best. Therefore unique designs are difficult to model.

Editor's Note: The author of this passage used the example of tilted walls simply to make the accompanying point. Tilted Walls are possible in Revit Architecture, but admittedly with a little more effort than common vertical ones.

Whereas CAD doesn't care—In CAD, geometry is geometry. CAD doesn't care what is or isn't a wall. You are still bound by the geometric limitations of the software (some CAD software support nonuniform rational b-splines [NURBS] curves and surfaces, and others do not, for instance), but for the most part there is always a way to construct arbitrary forms if you want.

• Section I •

Building Information Modeling | •15

Editor's Note: In the last few releases of Revit, the Massing Environment has added many ways to easily model complex forms. These forms in the Massing Environment can be constructed parametrically and given rules and behaviors, but unless designated specifically as such, will not have any knowledge of what sort of element they are.

Chapter 17 explores the Massing Environment.

Modeling can help project coordination—Having a single unified description of a building can help coordinate a project. Because drawings cannot ever get out of sync, there is no need for concern that updates have not reached a certain party.

A single model could drive the whole building lifecycle—Increasingly, there is interest in the architectural community for designing the entire lifecycle of a building, which lasts much longer than the design and construction phases. A full building description is invaluable for such design. Energy use can be calculated from the building model, or security practices can be prototyped, for

instance. Building systems can be made aware of their context in the whole structure.

BIM potentially expands the role of the designer—Clearly this has implications for the role of

architects. They may become the designers of more than the building form, but also specifiers of use patterns and building services.

Modeling may not save time while it's being learned—It is likely that while designers are learning to model rather than to draft, the technique will not save time in an office. That is to be expected. The same is true of CAD. Switching offices from hand drafting to CAD occurred only as

students became trained in CAD and did not therefore have to learn the techniques on the job. The same is likely to be true of BIM design. But students are beginning to learn it, and it is rapidly becoming an integral part of practice in most offices.

Potential hazards exist in BIM that do not exist in CAD—Because design intelligence is embedded into a model, it is equally possible to embed design stupidity.

Editor's Note: For example, if the computer operator inputs a floor to floor height of only 4 feet [1200 millimeters], BIM software will not automatically correct or even flag this as

an error. The knowledge of the architect is still the driving force behind the design intent that creates the model. Building Information Modeling software by itself does not

replace the knowledge and experience of an Architect.

Improperly structured models that look fine can be unusable—It is possible to make a model that looks fine but is created in such a way that it is essentially unusable. For instance, it may be possible to create something that looks like a window out of a collection of extremely tiny walls. But then the program's rules for the behavior of windows would be wasted. Further, its rules for the behavior of walls would cause it to do the wrong things [with the "windows" modeled this way] when the design changed.

• Preface and Introduction •

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What is an engineering technique doing in architecture? —BIM design comes from engineering techniques that have been refined for many years. Many forces are acting together to bring engineering methodologies like BIM into architecture. First, the computing power and the basic ability to use computers have become commonly available. Second, efficiencies of time and money are increasingly part of an architect's concern. BIM offers a possible edge in efficiency of design and construction.

Editor's Note: You can find the original version of the preceding text as part of the

Instructor Lecture Notes document on Autodesk's Web site in PDF format. The quoted

portion here is only a small part of the entire document. You can learn more about

DEFINING BIM

This quoted passage does a wonderful job at outlining the high-level concepts involved in BIM and comparing and contrasting its tenets and techniques to traditional CAD and drafting methods. Using the points raised in this article, let's try to synthesize them into a working definition of Building Information Modeling.

Building Information Model(ing) is frequently misunderstood. "BIM" is often assumed to be synonymous with simply generating a three-dimensional (3D) model of a building—whether that model has any useful non-graphical information or not, and regardless of the level to which the 3D model is detailed. There is much more to BIM than that. Building Information Modeling is an evolving concept; one that will continue to change as the capabilities of technology and our own ability to manipulate technology improve. These issues make it difficult to formulate a simple definition for BIM. However, as the popularity of BIM is growing, reaching a consensus on its meaning and intent is increasingly important. 3D models are certainly important in BIM; in many ways critical to it. However, summarizing all of the points made so far, the emphasis really belongs on the "I"—Information in BIM. That information can be either graphical (3D or even 2D) or non-graphical; either contained directly in the building model or accessible from the building model through linked data that is stored elsewhere. As has already been mentioned in the quoted passage above, when you exercise BIM, you are making a model which is a full description of a building—not just a 3D model. A data model is just as valid a model as a geometric model. (This is not a new concept in Architecture: consider the existing requirement in most jurisdictions of both a set of drawings and a written specification to complete a construction documents package.) Despite the importance of these distinctions,

when we think of a Building Information Model, a three-dimensional geometric model of the building is often what comes to mind. So the first step to fully understanding BIM is to realize that “BIM” and “3D Model” are not the same thing.

In simple terms, a Building Information Model is a complete representation or depiction of a building that aids in its design, construction and potentially ongoing management. Such representation will often employ any combination of 3D graphics, 2D abstractions, and/or non-graphical data as required for conveying full intent. The coordination and delivery of information and intent is the most important goal in BIM. To be considered BIM, all deliverables should be fully coordinated and provide a platform for meaningful computation.

DEFINING DIM (DESIGN INTENT MODELING)

In the previous passages, we took a “high level” look at BIM. The BIM process requires that all stakeholders of the project be involved. This would include the project design team, the contractors, and the building owner. If all the stakeholders of the project are not involved throughout, the BIM process has a chance of failing. This is because the BIM process should carry through the entire life cycle of the building project. This means that project information will be maintained throughout the life cycle of the building.

Where does the Building Information Modeling process begin? It typically begins from a DIM (Design Intent Model(ing)). Most design professionals, architects, engineers, and construction professionals work in a competitive bid environment. This means that there are multiple manufacturers that could submit a bid on a particular product. Some products have enough variation to their shape and size that causes connections to be made differently or those connections might even be in a different location. This typically occurs in engineering systems. In a competitive bid environment you cannot typically sole source a product manufacturer. In such a situation, you are focused on ensuring that all acceptable

manufacturers will work within the space provided. However, your final design indicates only one of the manufacturers on the plans and in your schedules. This does not mean that the other manufacturers will not work in the space allocated. This simply means that you had to choose a direction in order to complete your project. If there is any deviation from your direction then it falls to the contractor to address that deviation/variation through means and methods. This is where Navisworks comes in handy and can help identify and potential construction related issues based on deviations and/or variations of the DIM.

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KEY CONCEPTS OF BIM COLLABORATION

So now that you have an understanding of BIM and DIM you might be wondering how it specifically relates to Navisworks. More importantly, you might also be wondering how these concepts will improve the way you work. The main goal of this book is to give you the tools you need to become comfortable using Navisworks in your own projects. Once you have begun using Navisworks, we are confident you will find it becomes an invaluable part of your overall BIM workflow.

SUMMARY

Building Information Modeling is the process of creating an accurate representation of the building including its form, functions, and systems from which detailed and accurate information can be extracted.

Typically, Design Intent Modeling starts the Building Information Modeling process.

Navisworks is a tool that will help you bridge the gap from DIM to BIM in your project workflow.

Section II

Understanding Navisworks

WHAT’S IN THIS SECTION?

Currently, there are three different “flavors” of Navisworks. There is Navisworks Freedom, Navisworks Simulate, and Navisworks Manage. This section will focus on the common tools available in those three Navisworks products.

Within this section you will gain valuable experience by exploring the Navisworks product and learning about the Navisworks user interface, settings, files, and navigation tools. Not to mention the overall conceptual underpinnings of the Navisworks product itself. Please note that not all the tools discussed in this section will apply to all three “flavors” of the Navisworks products.

SECTION II IS ORGANIZED AS FOLLOWS:

-

[Chapter 2 User Interface](#)

-

[Chapter 3 Global Settings and File Options](#)

-

[Chapter 4 Files and File Management](#)

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[Chapter 5 Model Navigation](#)



Chapter 2

User Interface

INTRODUCTION

This chapter is designed to acquaint you with the user interface and the work environment of Navisworks. The Navisworks user interface is fairly simple, logically organized, and easy to learn. In this chapter, we will explore the features of the user interface. Many features of the user interface follow standard Microsoft Windows™ conventions. Some aspects of the user interface are unique to Navisworks. The overall goal of this chapter is to help you feel more comfortable with all aspects of interacting with and receiving feedback from the Navisworks products. Many of the lessons that follow are descriptive in nature but please feel free to follow along in your Navisworks product as you read this chapter.

OBJECTIVES

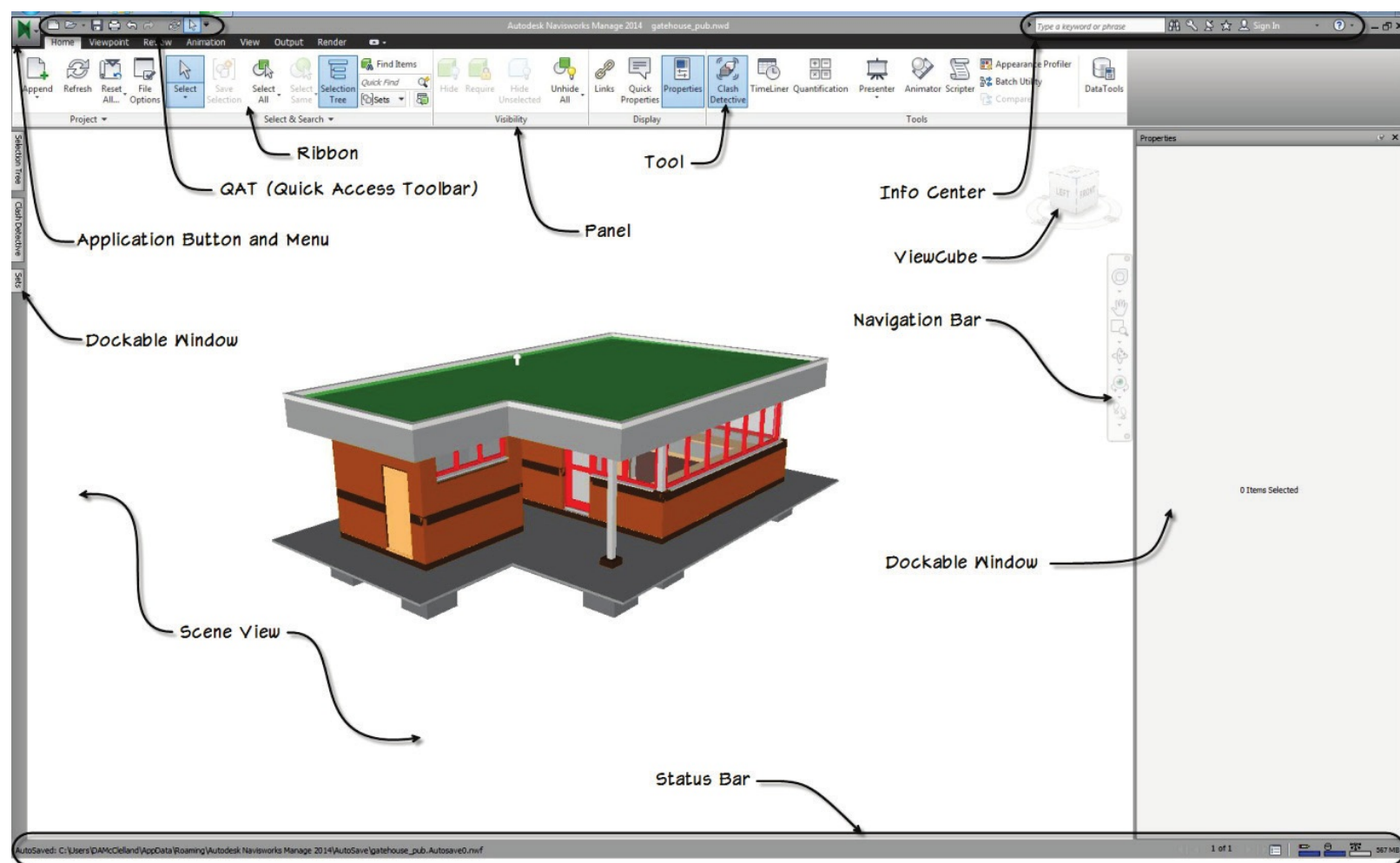
To quickly acquaint you with the Navisworks user interface. Topics we will explore include:

- An overview of the Navisworks User Interface.
- User Interface terminology.
- The Ribbon, QAT (Quick Access Toolbar), the Navigation and Status Bars.
- Status Bar performance indicators.
- Scene View navigation.
- Workspace settings.

UNDERSTANDING THE USER INTERFACE

Navisworks offers a very clean and streamlined work environment designed to put the Navisworks tools within easy reach. In addition, many onscreen tools and controls have keyboard shortcuts. For example, pressing the CTRL and F12 keys simultaneously on your keyboard will toggle the Selection Tree window on or off. This is only one example. Many

other shortcuts are available. To review a list of the most current keyboard shortcuts you are



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encouraged to type: “*Reference for the Default Keyboard Shortcuts*” in the Search box at the top-right corner of the screen. This will display a list of shortcuts in the Navisworks help.

[Figure 2.1](#) shows the Navisworks user interface with each major component labeled.

FIGURE 2.1

The Navisworks User Interface

The Navisworks user interface can be broken down into eight (8) distinct components:

Application menu

QAT (Quick Access Toolbar)

Info Center

Ribbon

Scene View

Navigation Bar

Dockable Window

Status Bar

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Let's start with an overview of each item. The ribbon is the tabbed panel across the top of the screen that includes all of the software's tool buttons and controls. This ribbon interface is common amongst many popular software packages. The concept of the ribbon-style interface involves making commands and tools easily accessible and to present specific tools to you in context with the task you are performing.

Above the ribbon in the top left corner of the Navisworks screen is the Application Menu, adorned by the large Navisworks "N" icon, and the QAT (Quick Access Toolbar). In the top right corner are the standard Windows minimize, maximize, and close icons. Immediately to the left of those is the Info Center and Help icon. (Refer to the previous figure to help you locate each item).

In the help area you can click Autodesk 360 to sign in to your Autodesk account and access services that integrate with your Navisworks product. Consistent with most Windows applications, a status bar occupies the bottom right corner just below the Scene View.

Navisworks windows can be docked to the left, right, bottom, or top of the Scene View or then can be left floating (not docked). Take some time to acquaint yourself with the various user interface elements. You can also hover over tools and a tool tip will display giving you a brief description of the tool in general. If you desire more information on that tool simply press the F1 key while still hovering over it.

Now that we understand the location of each interface item, let's begin reviewing the

components of the user interface in more detail.

APPLICATION MENU

File access and management tools are grouped under the Application Menu which is adorned by the large Navisworks “N” icon. Click the big “N” to open the Application Menu. If this is your first time launching Navisworks, the right side of the Application Menu will be empty.

However, as you open and close files, the list of recent files will begin to populate.

Navisworks remembers the last several files you have opened and lists them there. Once a file appears in the list, you can click the pushpin icon to permanently “pin” a particular file to the menu reducing the need to browse to the file location (see [Figure 2.2](#)).

• Understanding Navisworks •

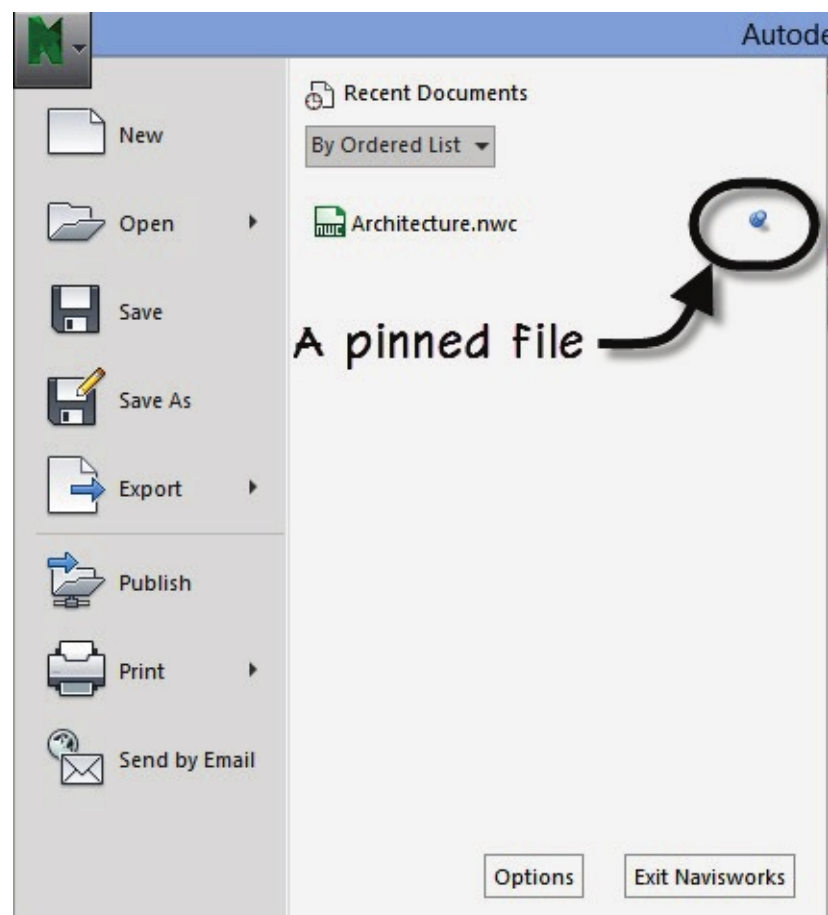
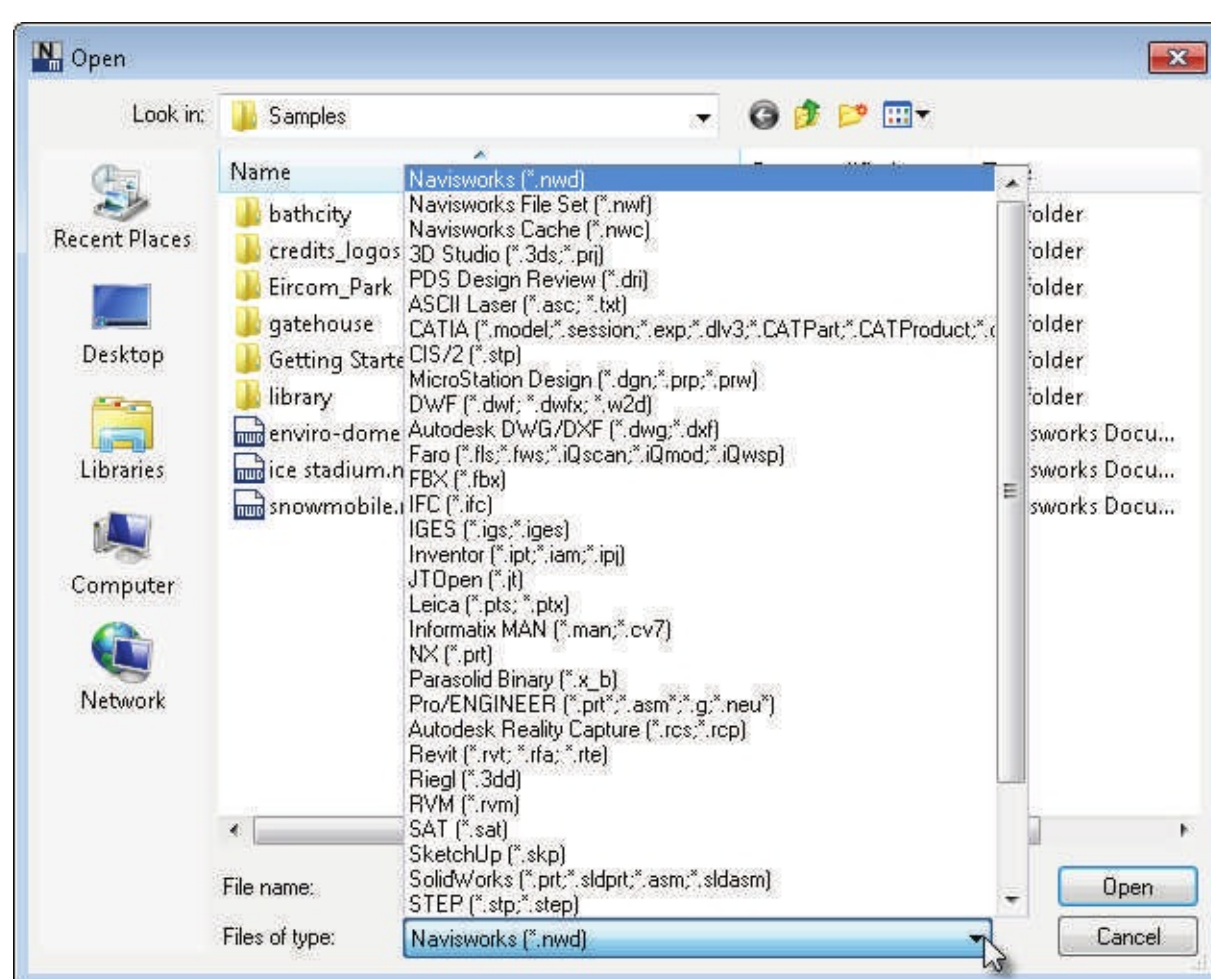


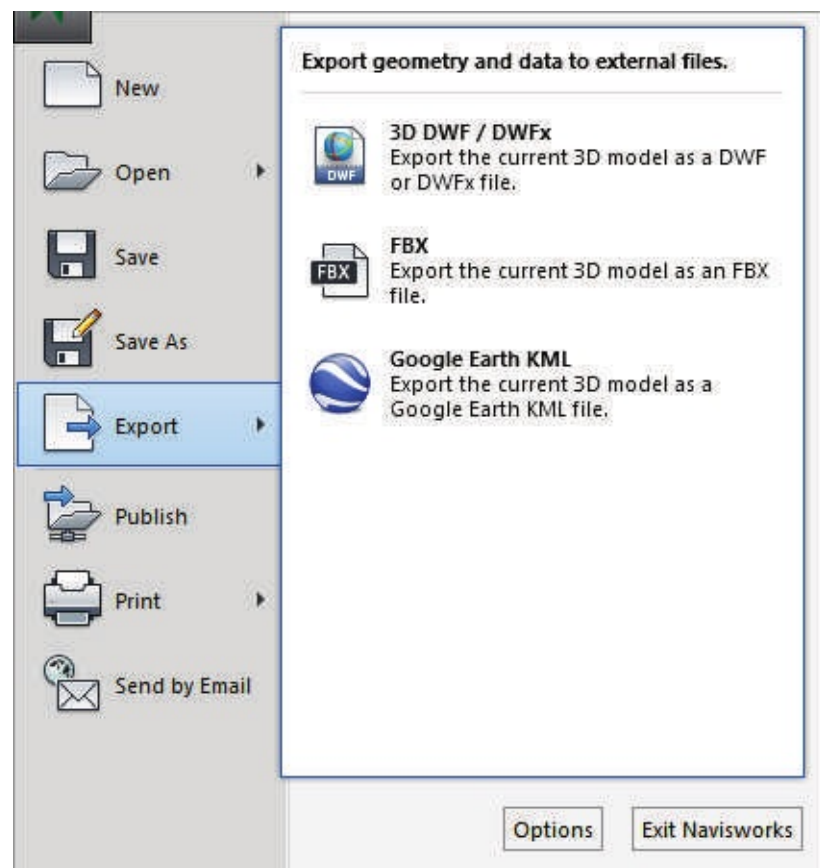
FIGURE 2.2

The Application Menu

On the left side of the Application Menu, you will find standard file management commands like New, Open, Save, and Save As, to name a few. Sub-menus on Open, Export, and Print provide additional options for each of those tasks. For example, Navisworks has the ability to open various different file types like: DGN (MicroStation), DWG (AutoCAD), IFC (Industry Foundation Classification), MODEL (Catia), PTS (Lecia), SKP (SketchUp), and RVT (Revit) file formats just to name a few ([see Figure 2.3](#)).

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FIGURE 2.3

Navisworks can open several different types of files in their native format

You can find a complete list of the file formats that Navisworks supports on the Autodesk website. You can also type: **Supported CAD File Formats** in the Search tab in the Navisworks Help.

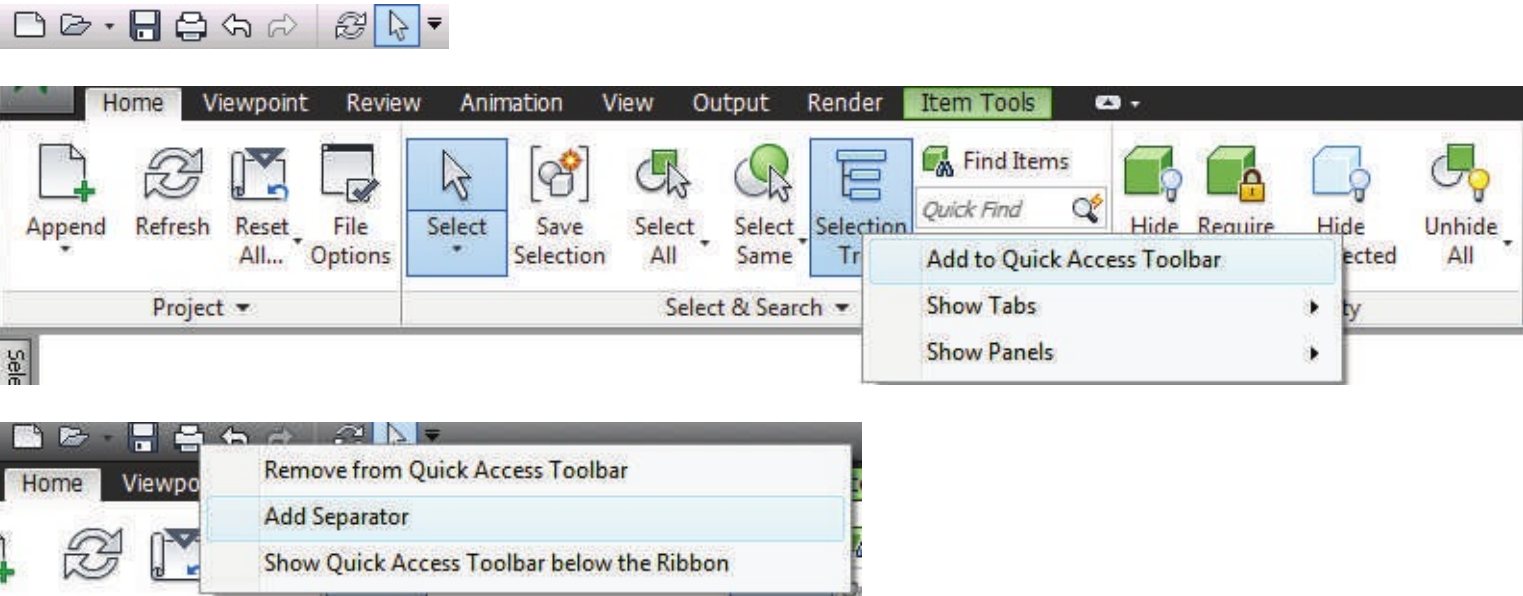
If you want to share your Navisworks file with others, you can export it to the DWFx, FBX or a Google Earth KML file formats ([see Figure 2.4](#)).

FIGURE 2.4

Export options are also available from the Application Menu

To exit Navisworks, use the command at the bottom of the menu. Navisworks will prompt you to save any unsaved changes to your work. Use the Options button to open the Options

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Editor dialog. This dialog has many program preferences that you can configure. Most of the out-of-the-box settings are suitable for the beginner. There might be a few items that you or your CAD/BIM Manager would want to adjust. Refer to the “Options” topic below and in later chapters.

Saving and printing are also available from the Application menu.

QAT (QUICK ACCESS TOOLBAR)

The QAT (Quick Access Toolbar) as its name implies is a location for commonly used tools to which you wish to have easy and “quick access.” The default QAT includes New, Open, Save, Print, Undo, Redo, Refresh, and Select ([see Figure 2.5](#)).

FIGURE 2.5

Common tools in Navisworks are pre-populated on the QAT

You can add buttons to the QAT by simply hovering over the Navisworks tool you wish to add, right-click and choose Add to Quick Access Toolbar ([see Figure 2.6](#)).

FIGURE 2.6

Additional tools can be added to the QAT

A separator can be added between tools to visually group them together. To add a separator in the QAT hover over the tool on the QAT right-click and choose Add Separator (see [Figure 2.7](#)). The separator will appear to the right of the selected tool.

FIGURE 2.7

Add a separator between Tools on the QAT

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Note: Unlike other Autodesk products, there is very little customization that can occur with the QAT. For example, once a tool is added to the QAT the tool cannot be moved to a different position on the QAT.

You can move the QAT below the ribbon if you prefer. To accomplish this, you can right-click anywhere on the QAT and then select Show Quick Access Toolbar below the Ribbon. This will give you more space which will allow you to add more tools to the QAT. However, the trade-off is that when the QAT is below the Ribbon it will reduce the Scene View area slightly.

RIBBONS

Run most commands by clicking a tool on the ribbon. A series of tabs appears just beneath the QAT. Each tab is separated into one or more Panels. Each Panel contains one or more tools (Buttons) (refer back to [Figure 2.1 above](#)). To navigate the ribbon, click a tab, locate the panel and the tool you need, and then just click the button to begin a command. When tutorial instructions are given in this text, you will be directed first to the tab, then the panel, and finally the tool (button). For example, instructions to execute the Selection Tree tool might look something like this:

On the Home tab, on the Select & Search panel, click the Selection Tree tool.

In the context of the exercise, when it is obvious which tab or panel, the description might be shortened to something like:

On the Select & Search panel, click Selection Tree.

or just:

Click Selection Tree.

CONTEXTUAL RIBBON TABS

In addition to the default ribbon tabs, certain actions performed in the software will cause other ribbon tabs to appear. These are called “Contextual” ribbon tabs. For example, when selecting an item in Navisworks the Item Tools contextual tab will appear that provides tools specifically for the item selected ([see Figure 2.8](#)).

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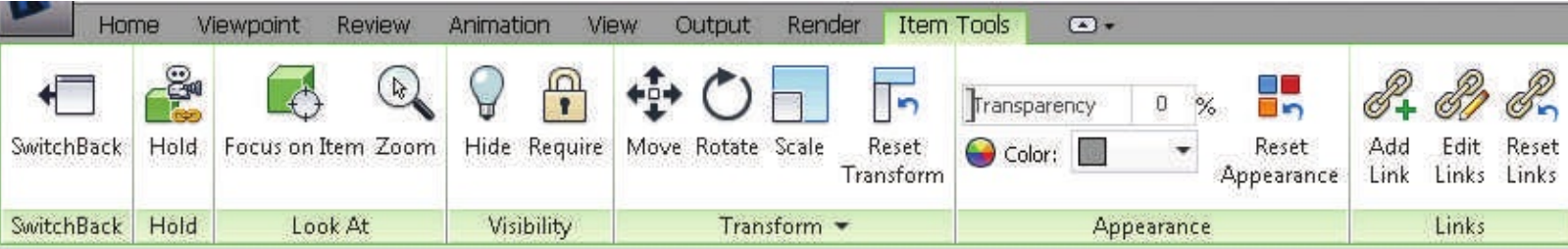


FIGURE 2.8

Contextual tabs are available after certain commands have been executed

PANELS

Ribbons are segregated into panels to help classify and group the various tools. If you use the tools on a particular panel frequently, you can “tear off” the entire panel. This makes the panel into a floating toolbar on your screen. You can drag such a floating panel anywhere you like, even to a secondary monitor if you have one attached to your system. If you “tear off” any panels, Navisworks will remember the custom locations of the panels the next time you launch the application.

If you tear off a panel and later wish to restore it, simply move your mouse over the floating panel. This will make gray bars appear on each side. On the left side, there is a drag bar that you can use to drag the panel around your screen to a new location. On the right side, there is a small icon that if clicked will restore the panel to its original ribbon tab and location.

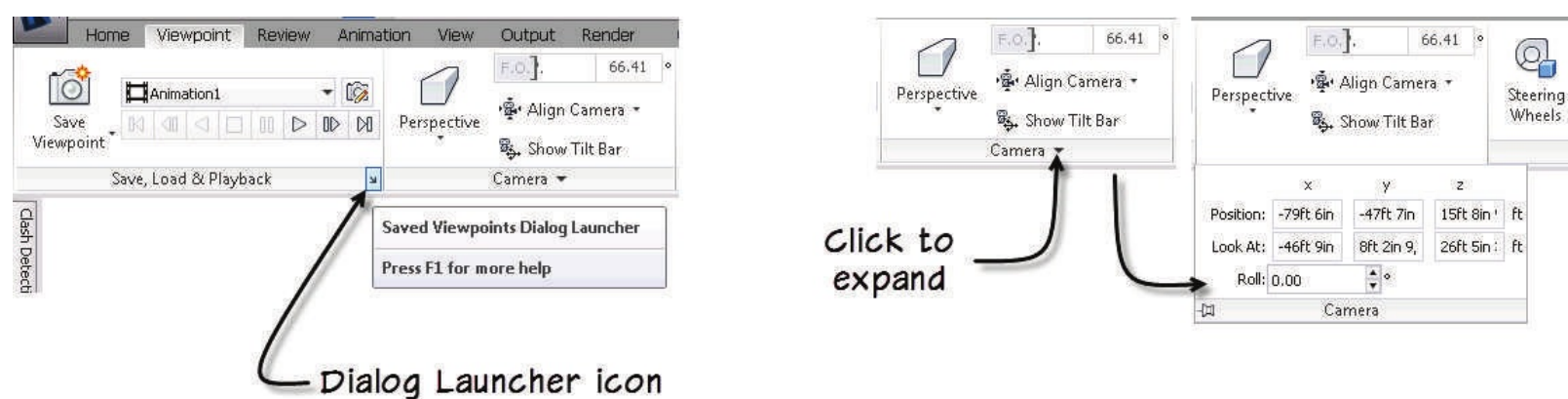
Note: Feel free to customize your interface by tearing off panels if you wish. However, all instructions in the tutorials that follow assume that panels are in their default locations on the ribbon tabs and refer to them as such.

You can only tear off panels on the permanent default ribbon tabs. Panels on contextual ribbon tabs cannot be torn off and left floating on screen.

On the panel title bar (bottom edge of the panel), most panels simply show the name of the panel. In some cases, however, a small icon will appear on the right side of the title. This can be one of two icons. The left side of [Figure 2.9](#) shows a “Dialog Launcher” icon. Clicking an icon such as this will open a dialog. Usually these are settings dialogs that you use to

configure several options for a particular type of element.

• Section II •



Click the drop-down to change the size of the Ribbon

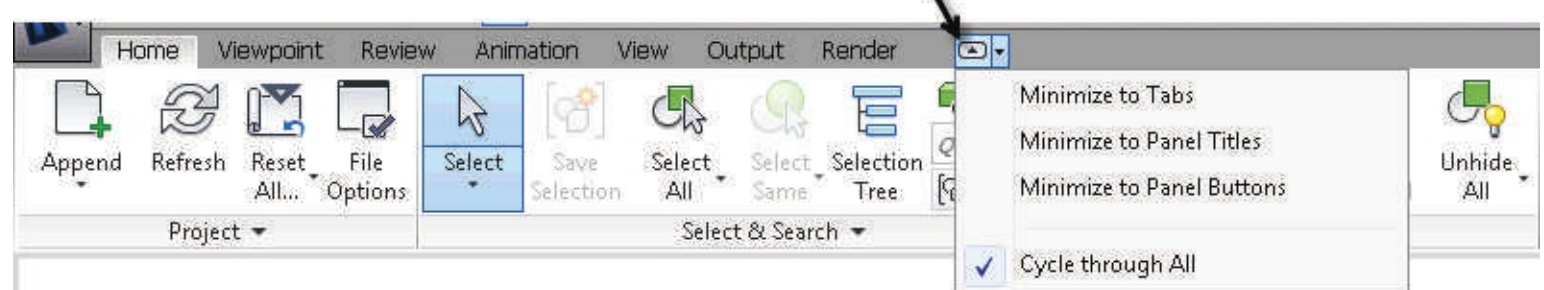


FIGURE 2.9

Panel with a Dialog Launcher icon on the left and an expanded panel on the right

On the right side of [Figure 2.9](#) an expanded Panel is shown. In this case, clicking the panel title expands the panel temporarily to reveal additional related tools. Such tools are typically used less frequently than the ones always visible on the main panel. Expanded panels are not

ideal, but provide a compromise to what would otherwise be overcrowded ribbon panels in those instances where expanded panels are utilized.

RIBBON STATE

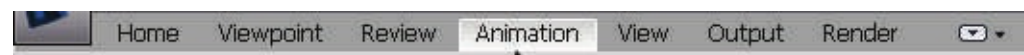
The ribbon can be set to one of four different sizes. The default ribbon size shows the complete ribbon and all tab panels. A portion of the top of your screen will always be reserved for the ribbon. By clicking the tabs in the ribbon you will switch which tools display. However, the same amount of screen space is used regardless of the current tab. The default state makes it very easy to see the tools but it does not help you maximize your scene view.

Three other ribbon states are available that use less screen space. The small icon to the right of the last tab in the ribbon tab bar can be used to re-size the ribbon and choose a different state ([see Figure 2.10](#)).

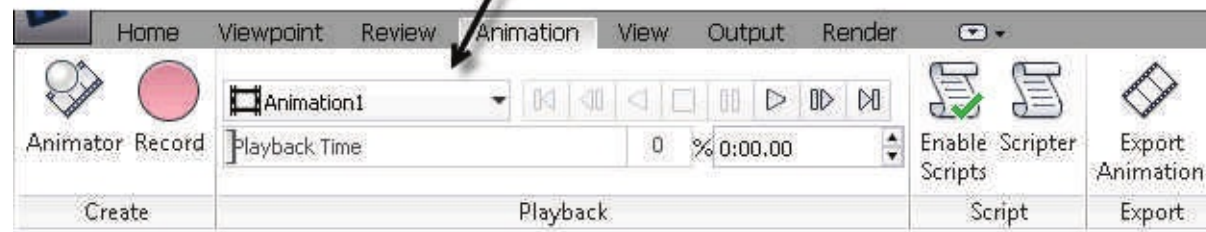
FIGURE 2.10

Panel with a Dialog Launcher icon on the left and an expanded panel on the right

• Understanding Navisworks •



Click the tab to display the entire tab



Hover over the Panel Title to display the entire Panel



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With Cycle through All selected in the drop-down you will be able to simply click the icon to change the ribbon state from one to another. When the Cycle through All is not selected you will need to choose which ribbon state you wish to have by selecting a specific state in the drop-down.

When the Minimize to Tabs option is selected the ribbon will show only the ribbon tabs (see top of [Figure 2.11](#)). This selection uses the least amount of screen space by showing only the ribbon tabs. Click on a ribbon tab to make the selected tab pop up (see bottom of [Figure 2.11](#)). When you shift focus away from the tab it will disappear from the screen.

FIGURE 2.11

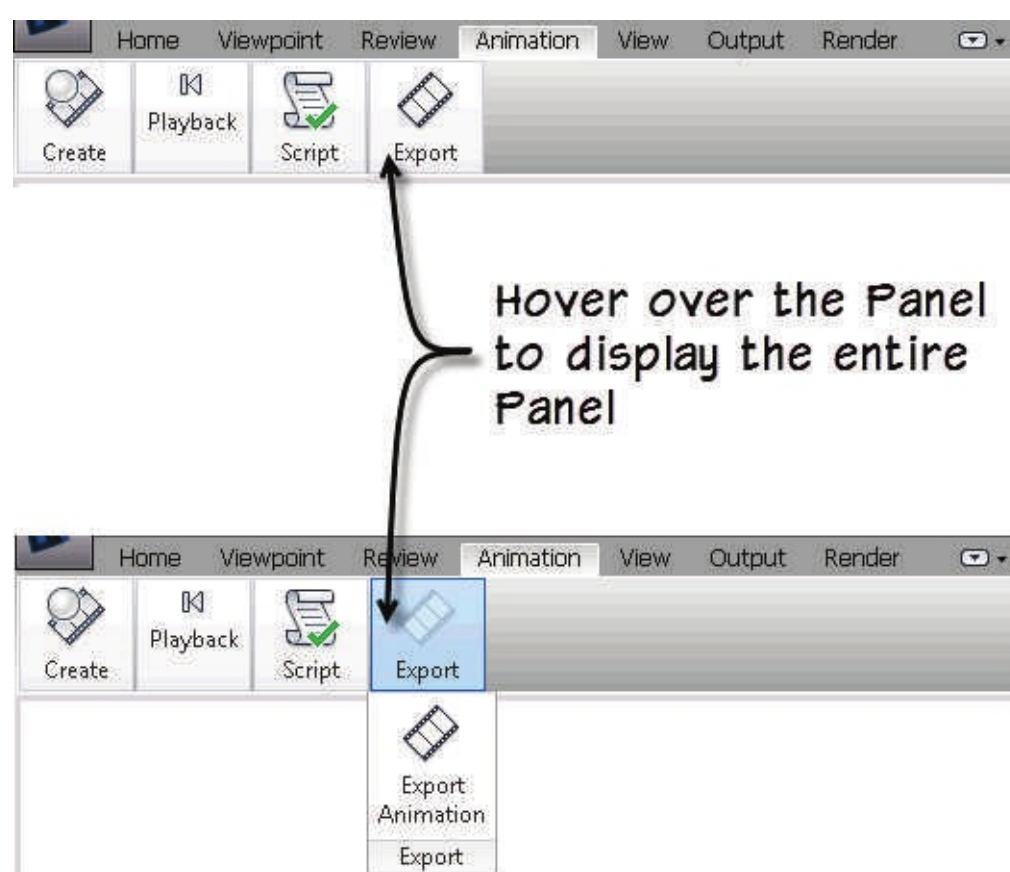
The Ribbon minimized to tabs only

When the Minimize to Panel Titles is selected the ribbon will switch from its current state to show only the ribbon tabs and the names of the panel titles of the selected ribbon tab (see top of [Figure 2.12](#)). Hover over the panel title to reveal the tools located on the selected panel (see bottom of [Figure 2.12](#)). When you shift focus away from the panel it will disappear from the screen.

FIGURE 2.12

The Ribbon minimized to tabs and Panel Titles only

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When the Minimize to Panel Buttons is selected the ribbon will switch from its current state to show only the ribbon tabs and the panel buttons (see top of [Figure 2.13](#)). In this state, the panel titles of the current ribbon are displayed as buttons. Pass your mouse over a panel button to reveal a pop-up with that panel's tools (see bottom of [Figure 2.13](#)). When you shift your focus away from the panel and it will disappear.

FIGURE 2.13

The Ribbon minimized to tabs and Panel Buttons only

Experiment with each state to discover the one that you prefer. If you wish to return to the default ribbon, cycle back through until it is displayed once again. If Cycle through All has been deselected in the drop-down then click the small icon to the right of the last tab in the ribbon tab bar to return to the default ribbon.

NOTE: Images and instructions throughout this text show the default ribbon state. Adjust accordingly if you choose to use one of the minimized modes.

TOOLS

Ribbon panels contain the Navisworks tools. Tools use one of three types of buttons: Buttons, drop-down buttons, and split buttons. An example of a button is the Refresh and Properties tool (see [Figure 2.14](#)).

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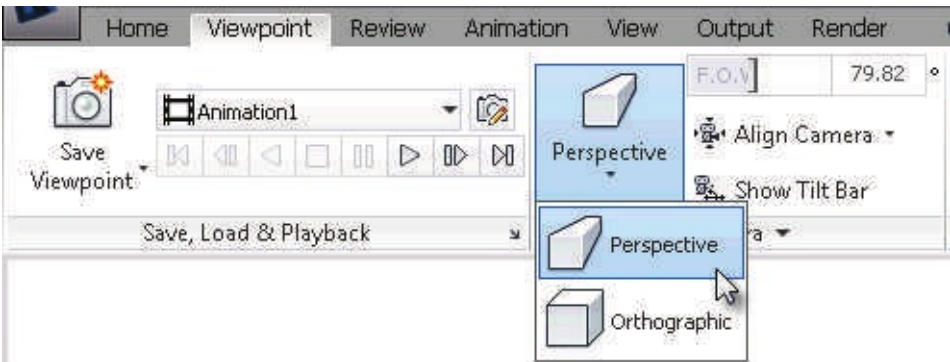


FIGURE 2.14

A button performs a specified action with a simple click

Clicking a button simply invokes a tool. In the case of the Properties tool a window opens to complete the command. In all cases, a simple button tool requires just one click to execute the tool.

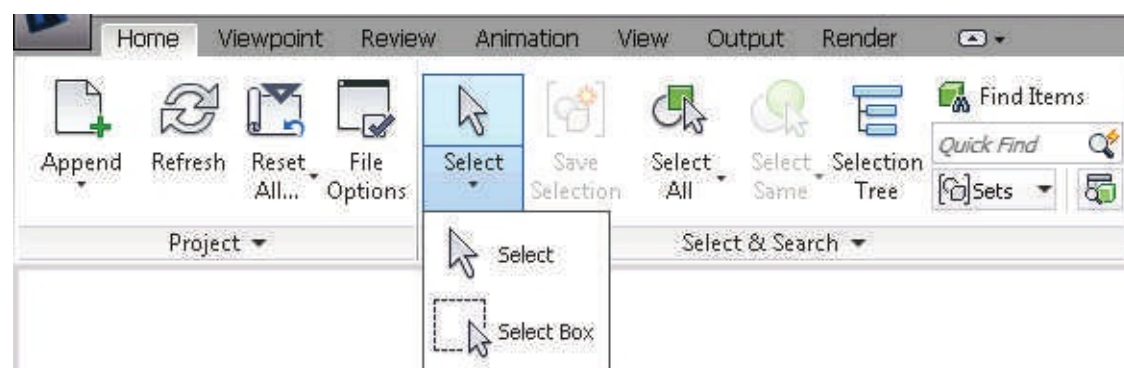
On the Viewpoint tab, on the Camera panel, the Perspective tool is an example of a drop-down button. In this case, if you click the tool, a drop-down list will appear showing the various options for the tool. In the case of the Perspective tool, we can choose from the Perspective or Orthographic tools (see [Figure 2.15](#)).

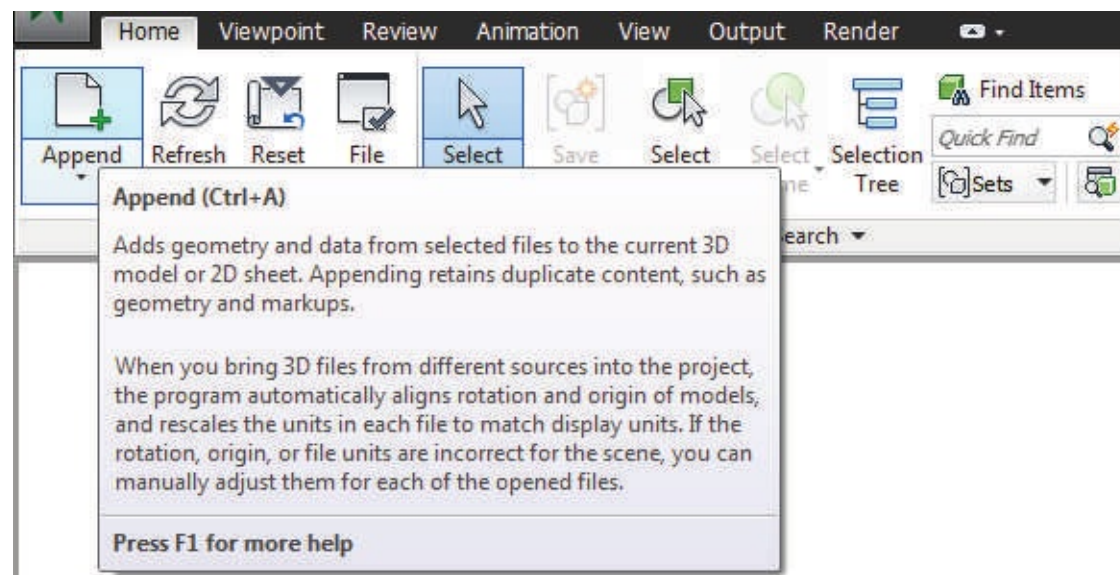
FIGURE 2.15

A drop-down button provides a small menu with options from which to choose

Split buttons are typical y horizontal in Navisworks. They appear like the other buttons until you pass your mouse over them, at which point it will be clear that there are two parts of the button that highlights under the mouse. The portion of the button with the smal pop-up indicator, a small upside down triangle, behaves like a drop-down button. The other side of the button behaves like a regular button. On the Home tab, on the Select & Search panel, the Select tool is an example of a split button (see [Figure 2.16](#)).

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FIGURE 2.16

A split button allows you to invoke a tool or choose from available options on the drop-down portion
 Some tools will appear grayed out if the particular command is not available in the current context. For instance, if you have not selected an item in Navisworks tools like Save Selection and Select Same will not be available until you select an item.

TOOLTIPS

Tooltips are available for most tools in Navisworks. When you hover your mouse pointer over a tool on the Ribbon a tooltip for the tool will typically be displayed. Some are progressive meaning that if you leave your mouse pointer over the tool for an extended period the tooltip will expand to show more information about the tool (see [Figure 2.17](#)).

FIGURE 2.17

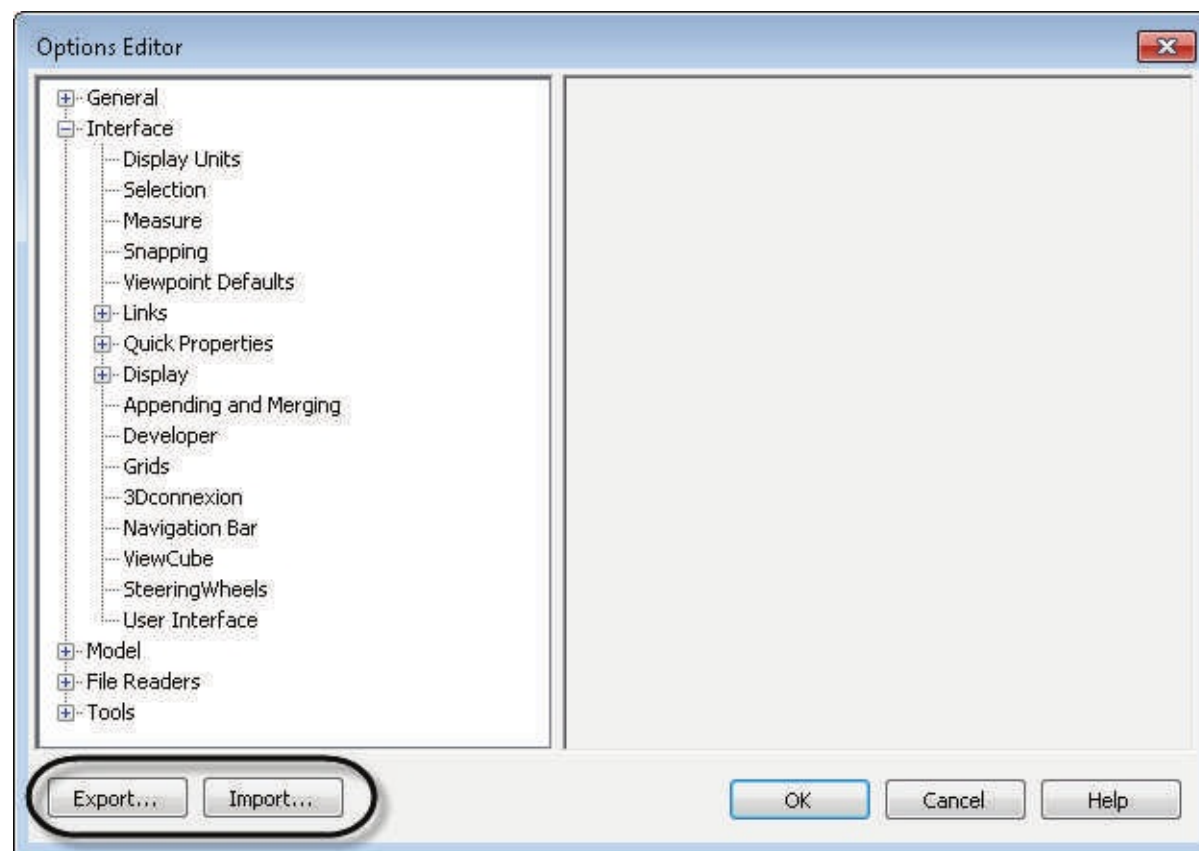
Tooltips appear when you hover your mouse over a tool

Once the tooltip is visible you can press F1 on your keyboard to learn more about a particular tool.

OPTIONS

Several aspects of the user interface have customizable options. From the Application menu, click the Options button (shown in [Figure 2.3](#) above) to open the Options Editor dialog.

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Expand Interface on the left in the Options Editor dialog. Click Selection to access the options that control the Highlight color of selected items on the screen. Click Measure under Interface and you can also control the color of the dimensions displayed on your screen as well. Click User Interface under Interface to select either a Dark or Light Navisworks background theme. Theme controls the overall color of the Ribbon.

Several companies have a single Navisworks product that is shared among all their employees. This means that the time you spent customizing your user interface could be lost after the next person using the product customizes the user interface and program settings to suit their needs. In order to avoid the need to configure settings each time you use the Navisworks product in a shared environment, you can Export your settings from the Options dialog to a specific folder location. Once you are ready to use Navisworks again you can Import your

settings through the Options dialog to restore them quickly ([see Figure 2.18](#)).

FIGURE 2.18

Navisworks Option settings can be exported and/or imported

We will dig deeper into the Navisworks Options settings in greater detail in the coming chapters.

KEYBOARD SHORTCUTS

As discussed above, Navisworks commands and functions are accessed from the ribbon. As an alternative to the ribbon, some commands and functions can also be executed through keyboard shortcuts. To use a keyboard shortcut, simply press the key on the keyboard. In certain cases, multiple keys will need to be pressed simultaneously. When you use a keyboard

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Default Keyboard Shortcut	Description
PgUp	Zooms to view all objects in the Scene View.
PgDn	Zooms to magnify all selected objects in the Scene View.
HOME	Takes you to Home view. This keyboard shortcut only applies to the Scene View windows. This means it will only work when this window has focus.
ESC	Deselects everything.
SHIFT	Used to modify the middle mouse button actions.
CTRL	Used to modify the middle mouse button actions.
ALT	Turns the keytips on or off.
ALT + F4	Closes the currently active dockable window when it is undocked, or exits the application if the main application window is active.
CTRL + 0	Turns on Turntable mode.
CTRL + 1	Turns on Select mode.
CTRL + 2	Turns on Walk mode.
CTRL + 3	Turns on Look Around mode.
CTRL + 4	Turns on Zoom mode.
CTRL + 5	Turns on Zoom Window mode.
CTRL + 6	Turns on Pan mode.
CTRL + 7	Turns on Orbit mode.
CTRL + 8	Turns on Free Orbit mode.
CTRL + 9	Turns on Fly mode.
CTRL + A	Displays the Append dialog box.
CTRL + D	Toggles Collision mode. You must be in appropriate navigation mode (that is, Walk or Fly) for this keyboard shortcut to work.
CTRL + F	Displays the Quick Find dialog box.

shortcut there will be no need to press ENTER following the keystrokes. [Figure 2.19](#) shows some keyboard shortcuts that are available in Navisworks. To review a complete list of the most current keyboard shortcuts in Navisworks, type *Reference for the Default Keyboard Shortcuts* in the Search tab in the Navisworks Help.

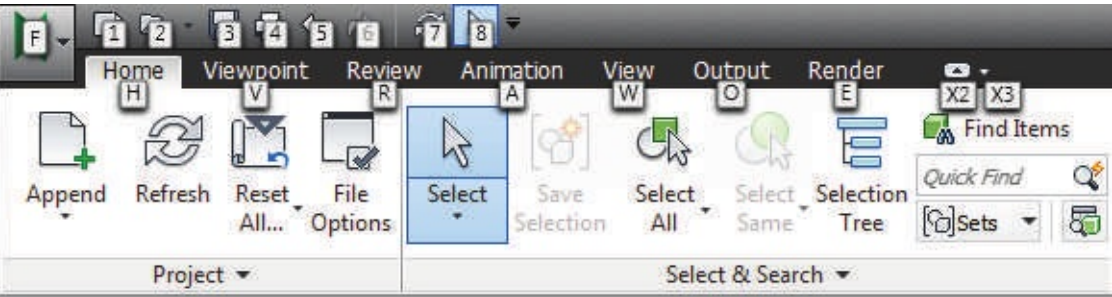
FIGURE 2.19

Keyboard shortcuts allow you to execute certain commands without having to locate the tool on the Ribbon For example, in lieu of navigating to the Home tab, Search & Select panel and clicking the Selection Tree tool, press CTRL + F12 to toggle the Selection Tree window on or off.

Note: Keyboard shortcuts cannot be modified in Navisworks.

Another Windows convention supported by Navisworks is Keytips. Keytips provide you the ability to issue menu commands through the keyboard after pressing the ALT key and either a letter or number combination for the desired command.

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Keytips are provided for the Application Menu, QAT, and the Ribbon. Standard Windows keyboard shortcuts, like CTRL + N, are available, as well. To discover the Keytips press the ALT key. Doing so will place a small label on each tool and ribbon tab (see [Figure 2.20](#)).

FIGURE 2.20

Keytips execute commands by pressing the ALT key plus a letter or number on the keyboard

Numbers appear on each of the tools on the QAT. Simply press this number to execute that command. Letters appear on each of the ribbon tabs. To invoke a tool on a tab, first press the letter for the tab. This will make a new set of letters appear on all the tools. Next press the key or keys shown on the tool.

For example, to access the Select tool through Keytips, press the ALT key, then the letter H, and then the letters SC. If a drop-down button is involved, similar to the Select tool, use the arrows on the keyboard to choose the desired command and then press ENTER to complete the selection.

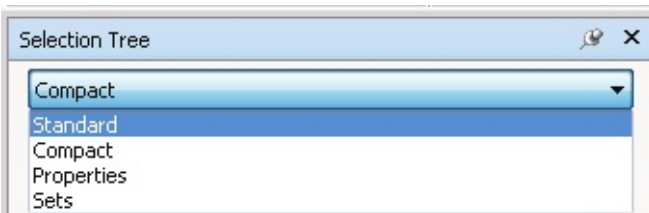
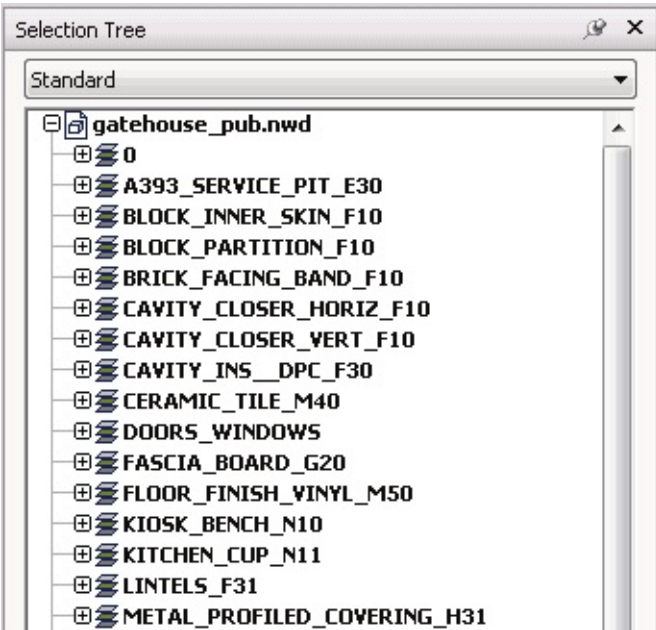
Note: When using the ALT key, even if the tab that you want is current you must still press the keystroke for the tab first.

SELECTION TREE

By default, the first time that you open the Navisworks product the Selection Tree window is not active or ready for use. You must click the Selection Tree tool to open the window to make it active. You can do this on the Home tab, on the Select & Search panel. When exiting the product, Navisworks will remember your user interface configuration and use it as the starting point the next time you open the product. Later in this chapter we will discuss how to save your Workspace settings.

The Section Tree is an important component that can help you better understand your project model as you are working in it. Therefore, it is recommended that you have the

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Selection Tree window open as you are working. Think of the Selection Tree as the table of contents for your project (see [Figure 2.21](#)).

FIGURE 2.21

The Selection Tree

The Selection Tree is a dockable window that can be relocated to a different part of your screen. This means that once the Selection Tree has been pinned open you can double click on the Selection Tree title bar to move the window anywhere you would like.

The Selection Tree hierarchy can display the components that make up each object found in the Selection Tree. For example, a door might consist of parts like a frame and panel and the panel might be broken down further into a PolyFace Mesh.

On the Selection Tree palette, directly below the title bar is the Selection Tree view drop-down (see [Figure 2.22](#)).

FIGURE 2.22

The Selection Tree view can be modified to show the hierarchy of items in different configurations
There are four view selection choices available in the drop down. Those choices are:

Standard—Displays the Selection Tree in its default state which includes all instances and the composition of each component.

Compact—Displays the Selection Tree in a simplified format standardizing items into either layers or levels.

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Note: The level of detail in the Compact Tree window can be set as a default through the Options Editor dialog under Interface > Selection. Use the Compact Tree drop-down to choose Model (Display model files only), Layers (Display model files down to the layer level), or Objects (Display model files down to the object level).

Properties—Displays the Selection Tree based on the properties of item’s in the model thus allowing for manual searching of the project by a particular item property.

Sets—Displays a list of selection and search sets in the project model.

Note: The list of Sets shown in the Selection Tree is the exact same list of Sets in the Sets dockable window or in the Sets drop-down found on the Home tab on the Select & Search panel.

The name of the item displayed in the Selection Tree typically reflects the name of the item from the original authoring application.

Note: You can copy and paste names from the Selection Tree. Simply select the item in the Selection Tree and right-click and choose Copy Name and then paste it where you would like.

You can sort the Selection Tree to change how it is organized. To do so, select al items in the tree, right-click, and choose: Scene>Sort (see [Figure 2.23](#)).

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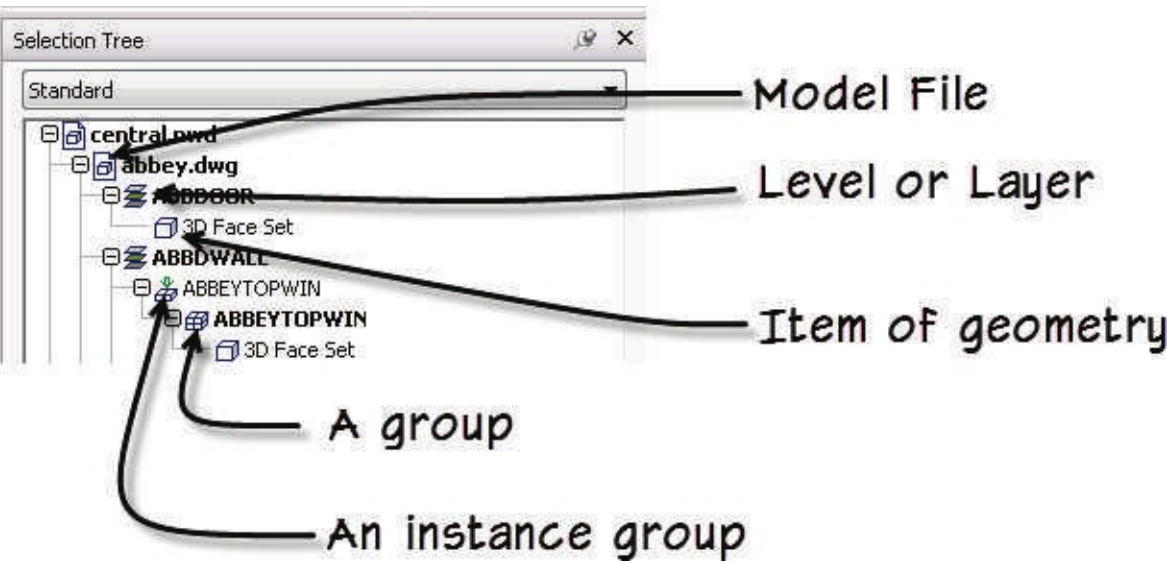
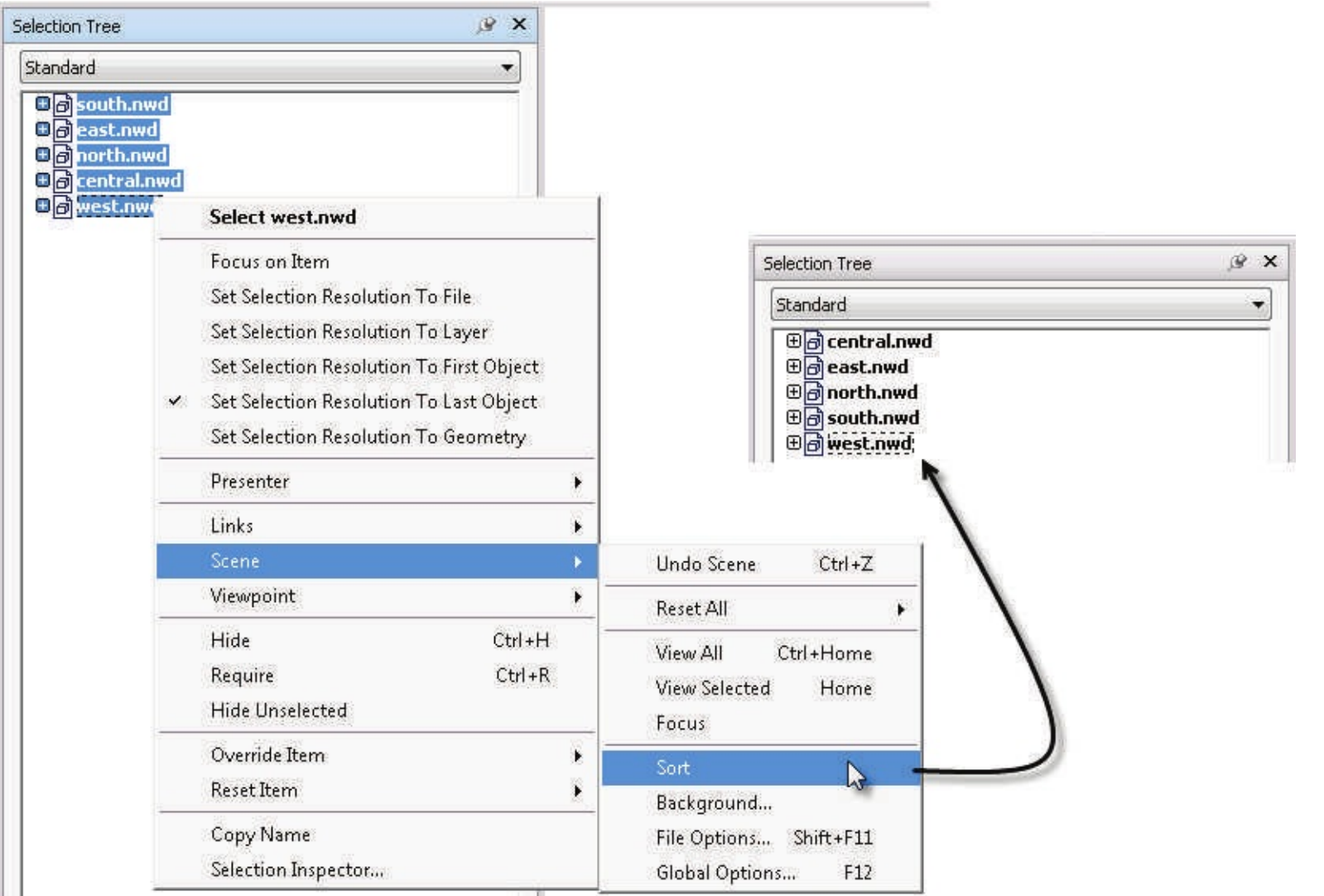


FIGURE 2.23

Organize the Selection Tree by sorting it

Note: Once the Selection Tree is sorted, you cannot Undo the sort.

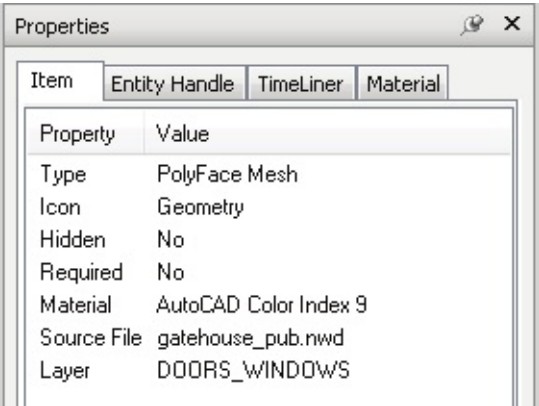
Within the Selection Tree there are several tree icons that represent different types of items (see [Figure 2.24](#)).

FIGURE 2.24

Selection Tree icons represent various kinds of items

In addition, when a color has been applied to an icon in the Selection Tree it will represent that an item has been hidden (gray), it is unhidden (dark blue) or it is required (red).

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Note: If a group is marked in some manner (hidden, unhidden, or required) then all instances of that group are marked the same.

PROPERTIES

By default, when you first open Navisworks the Properties window is not active. On the Home tab, on the Display panel, click the Properties tool to open the window to make it active. It is recommended that you have the Properties window open as you are working. Properties is a dockable window that displays object properties of a single selected object. Object properties of multiple objects will not be displayed in the Properties window. Once

an object is selected, a dedicated tab will appear at the top of the Properties window and each tab displays the property category associated with the selected object ([see Figure 2.25](#)).

FIGURE 2.25

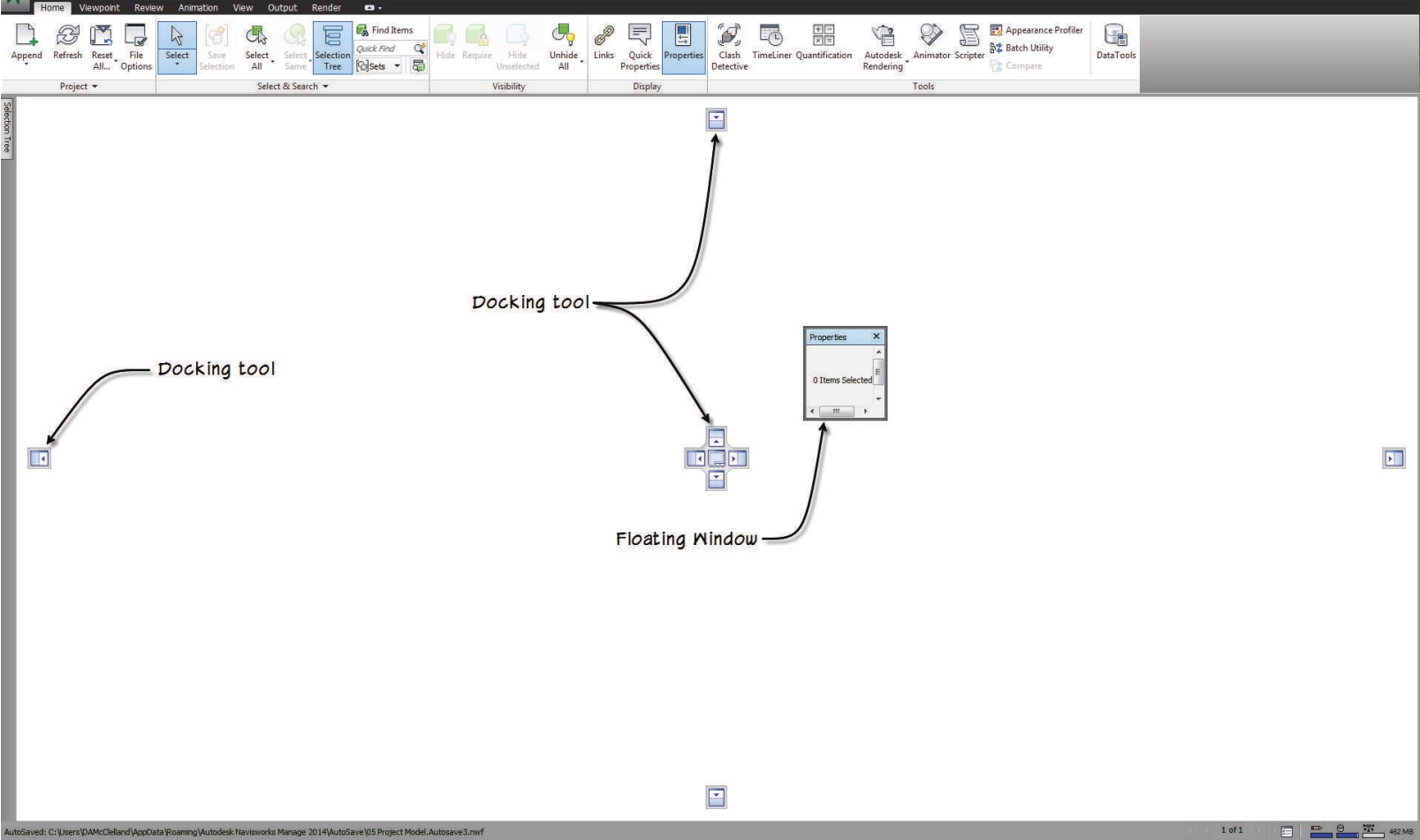
Object properties are displayed in the Properties window

Like the Selection Tree, the Properties window can be docked to any side of your screen or left floating.

DOCKABLE WINDOWS AND THE DOCKING TOOL

Certain Navisworks features are available through dockable windows and some of those dockable windows can be moved, resized, floated in the Scene View, or even floated outside the Navisworks product frame, on another screen for example. To quickly dock or undock a dockable window, pin the window first and then double-click on the dockable window's title bar. Double-clicking on an undocked window will return the window to the previously docked location. A docked window can share one or more edges with an adjacent window or toolbar. The docked window will change shape if the shared edge is moved. For example, the Find window can be docked at the bottom of the screen perhaps between two other windows, like the Selection Tree (left) and the Properties window (right). At that point there

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is a shared edge between the windows and if the size of the Selection Tree or Properties window is changed the Find window will shrink or expand accordingly.

You can use the Docking tool to dock a window. When using the docking tool the window will automatically become pinned to either the top, bottom, left, or right side of the Scene View (see [Figure 2.26](#)). You can still adjust the size of the docked window.

Note: The docking tool is only visible, as shown in [Figure 2.26](#), when the window is being moved in the Scene View.

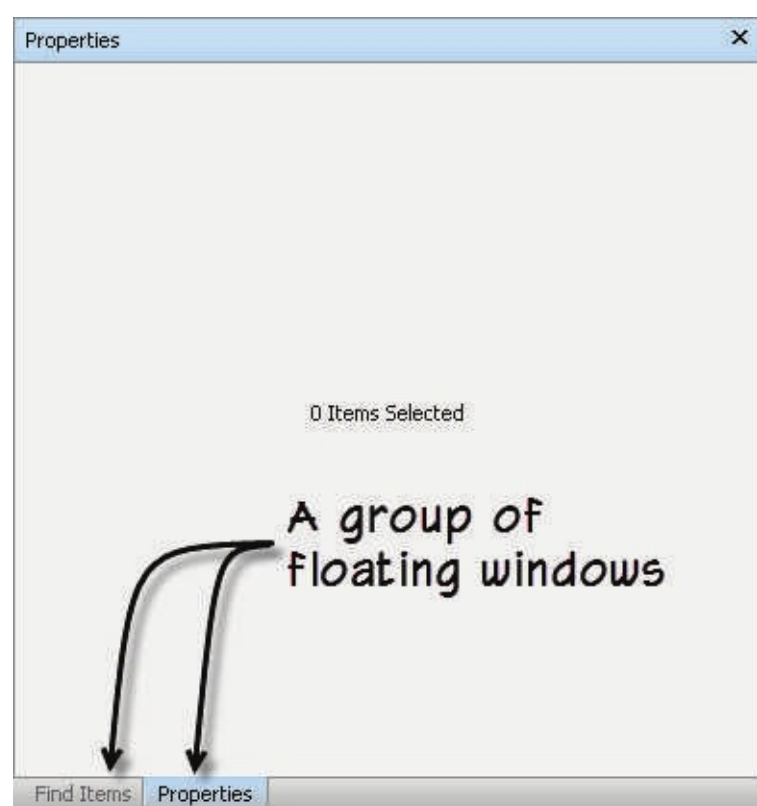
FIGURE 2.26

The Docking tool helps dock windows to one side or another of the Scene View

The Docking tool contains an inner and an outer docking component. The inner Docking tool will dock the window to one side of the Scene View or another (i.e. top, bottom, left, or right side) and the size of the docked window will take up approximately one-half of the

Scene View. Once docked in this manner you can adjust the size of the docked window.

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Note: When using the inner docking tool to dock your window you will not get the auto-hide functionality.

The outer Docking tool will dock the window to one side of the Scene View or another (i.e. top, bottom, left, or right side) and the size of the docked window will take up a significantly smaller portion of the Scene View than when using the inner Docking tool.

Note: When using the Docking tool a visual preview of the docking side and the size of the window will appear on the screen before you click to dock the window.

Dockable windows that are floating can be combined to form a group of dockable windows.

A group of dockable windows is a way for you to save screen space by combining your floating windows together. Tabs at the bottom of the group of windows will indicate which windows have been docked together ([see Figure 2.27](#)).

FIGURE 2.27

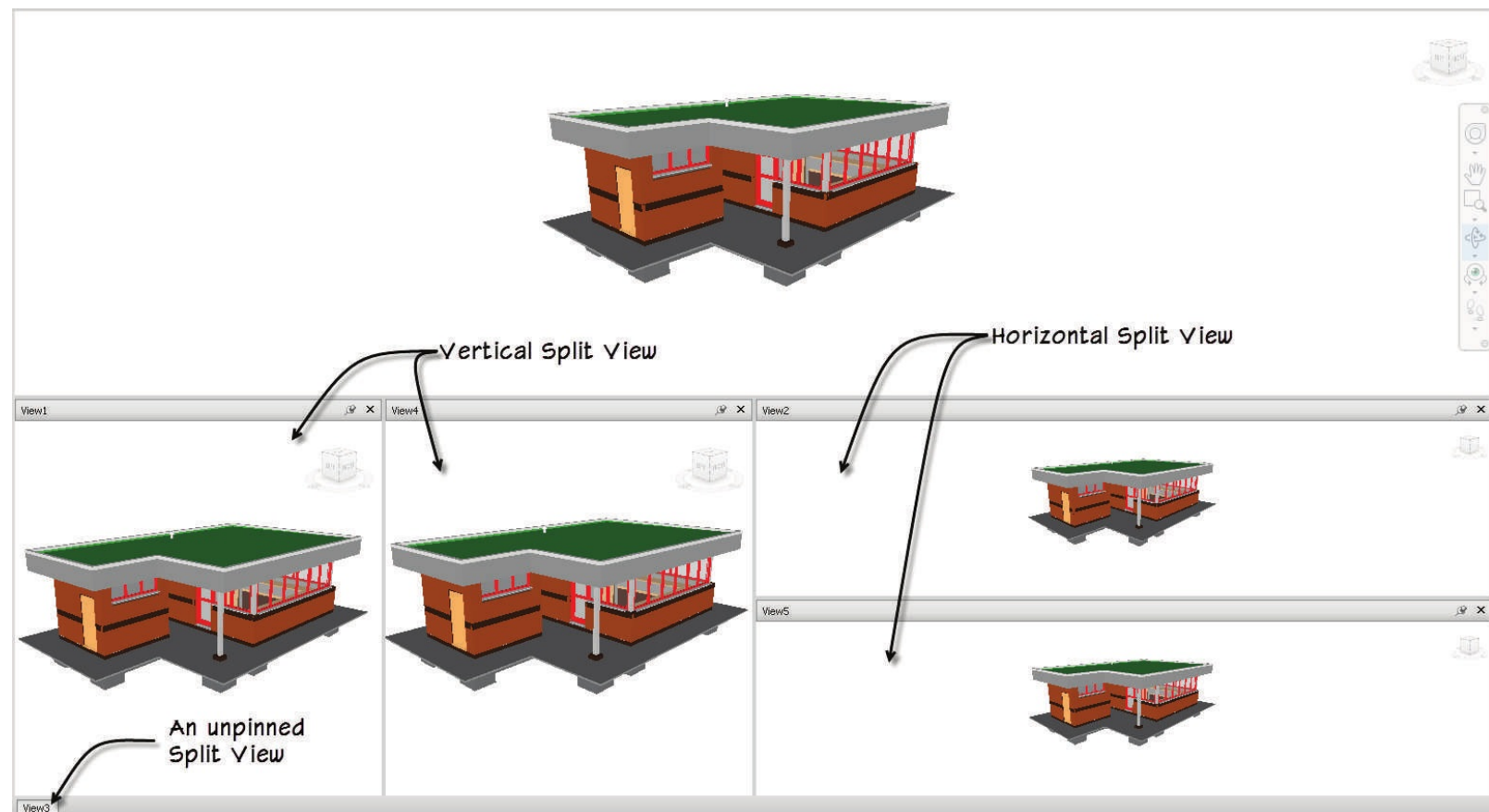
A group of floating windows can be docked together

To remove a window from the group of windows, double click the window title bar or simply click the window tab and drag the window away from the group of windows.

AUTO-HIDE (PIN)

If you unpin a docked window it will auto-hide on the side of the Scene View that it is docked on (i.e. top, bottom, left, or right side). Moving the mouse pointer over the tab of the

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unpinned docked window will temporarily display the docked window until the mouse pointer is moved away.

SCENE VIEW

The most interactive portion of the user interface is the Scene View. The Scene View is the area where you interact with your project model. You can create additional Scene Views through the Split View tool. The Split View tool is on the View tab, on the Scene View panel

and allows you to split a Scene View either horizontally or vertically and even allows you to split views multiple times. All views will be displayed in the overall Scene View unless a Split View has been unpinned. Once a Split View has been unpinned a tab with the Split View name will appear above the Status Bar ([see Figure 2.28](#)).

FIGURE 2.28

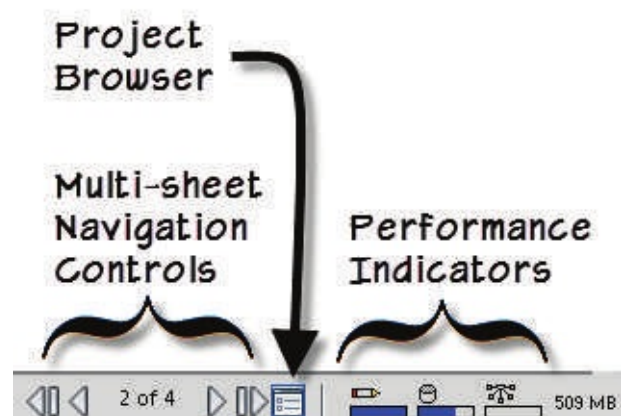
A Scene View can be split to create multiple Scene Views

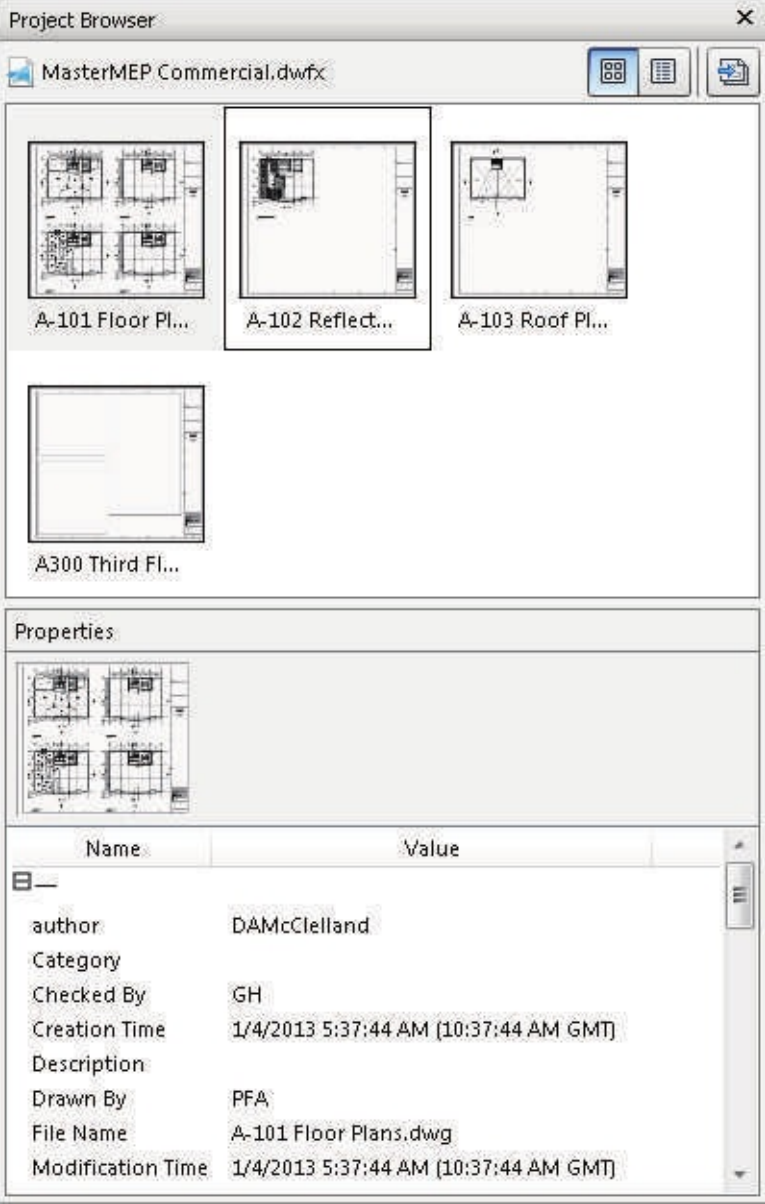
STATUS BAR

The Status Bar appears at the bottom edge of the screen and shows constant feedback about the Navisworks product and your project file.

If AutoSave has been enabled through Options, the left side of the Status Bar indicates the AutoSave file information. The right side of the Status Bar contains the Multi-sheet

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Navigation Controls, the Project Browser, and the Navisworks Performance Indicators (see [Figure 2.29](#)).

FIGURE 2.29

The Status Bar gives you feedback on the performance of Navisworks and your project model

The Multi-sheet Navigation Controls allow you to cycle through sheets that are included in your project model file. This is the same as double-clicking on the sheet in the Project Browser. Multi-sheet Navigation Controls are only available for multi-sheet project files.

STATUS BAR—PROJECT BROWSER

On the right side of the Status Bar, click the Project Browser icon to open the Project Browser window. The Project Browser is a dockable window which lists the sheets and their properties in the project model ([see Figure 2.30](#)).

FIGURE 2.30

When sheets are included in the project model the Project Browser will display the sheet information

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Directly below the Project Browser title bar is the name of the current file that is opened in Navisworks. The Project Browser lists all the sheets in a multi-sheet project file and can be sorted in Thumbnail or List View. Once a sheet is double-clicked in the Project Browser it will open in the Scene View and the properties of the sheet will be displayed in the Project Browser Properties window as well. The Project Browser Properties window lists information regarding the selected sheet. Although multiple sheets can be selected in the Project Browser by using the CTRL and/or SHIFT key only one sheet can be opened in the Scene View.

STATUS BAR—PERFORMANCE INDICATORS

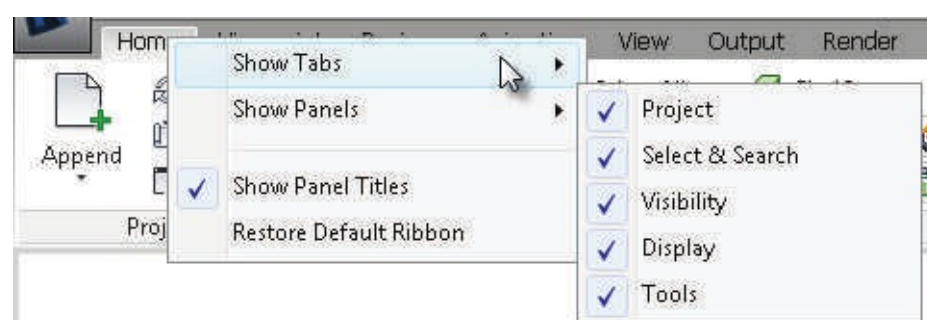
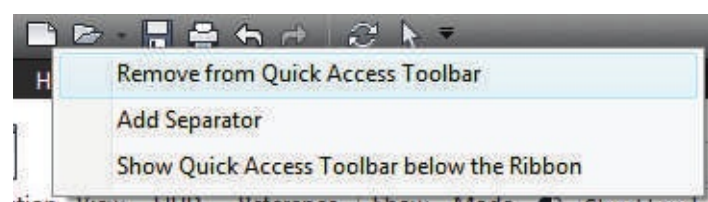
The Performance Indicators provide constant feedback on your Navisworks product and the performance of your project model. There are four Performance Indicators in the Status Bar. They are the Pencil Progress Bar, Disk Progress Bar, Web Server Progress Bar, and the Memory Bar (shown in [Figure 2.29 above](#)).

The Pencil Progress Bar, represented by the pencil icon, indicates the percentage of the current view that is drawn. In other words, the Pencil Progress Bar reflects how much drop-out there is in the current view. When the progress bar is fully colored this indicates that the scene is completely drawn and does not have any drop out. When the pencil icon changes color to yellow this indicates that the scene is being redrawn. If the pencil icon color changes to red this means that the computer has too much data to process and a slowdown has

occurred. If you repeatedly experience a red pencil icon it is recommended that you review your computer hardware to ensure that it is adequate to handle the Navisworks product and the models you are attempting to view.

The Disk Progress Bar, represented by the disk icon, indicates the percentage of the project model that is loaded from the disk. In other words, the Disk Progress Bar reflects how much of the project has been loaded into memory. When the Disk Progress Bar is fully colored this means that the entire model, including all the geometry and property information, has been loaded into memory. When the disk icon changes color to yellow this means that a file is being loaded. If the disk icon color changes to red this means that the computer has too much data to process and a slowdown has occurred. If you repeatedly experience a red disk icon it is recommended that you review your computer hardware to ensure that it is adequate to handle the Navisworks product.

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The Web Server Progress Bar, represented by the network icon, indicates the percentage of the project model that has been downloaded from a web server. When the Web Server Progress Bar is fully colored this means that the entire model, including all the geometry and property information, has been downloaded. When the network icon changes color to yellow

this means that a file download is in progress. If the network icon color changes to red this means that the computer has too much data to process and a slowdown has occurred. If you repeatedly experience a red network icon it is recommended that you review your computer hardware to ensure that it is adequate to handle the Navisworks product.

The final Performance Indicator in the Status Bar is the Memory Bar. The Memory Bar, represented by a number, indicates the total amount of memory, in Megabytes (MB), that is currently being used by Navisworks.

RIGHT-CLICK

You can right-click on almost anything to receive a context-sensitive menu. We have already discussed a few examples above. Let's look at a few more right-click options.

QAT (Quick Access Toolbar)—You can right-click on a tool to remove it from the QAT or add a separator after the tool ([see Figure 2.31](#)).

FIGURE 2.31

Right-click on the QAT to customize it

Ribbon Tab—If you find that you are not using particular Navisworks tools you can hide them, either by tab or panel, in order to streamline your ribbon Right-click a ribbon tab you will get an option to hide ribbon tabs or ribbon panels ([see Figure 2.32](#)).

FIGURE 2.32

Right-click on the ribbon tab to tabs or panels

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Scene	
Viewpoint	▶
Undo Current View	Ctrl+Z
Reset All	▶
Select	▶
View All	Ctrl+Home
Focus	
Background...	
File Options...	Shift+F11
Global Options...	F12

Select	
Focus on Item	
SwitchBack	
Set Selection Resolution To File	
Set Selection Resolution To Layer	
Set Selection Resolution To First Object	
✓ Set Selection Resolution To Last Object	
Set Selection Resolution To Geometry	
Presenter	▶
Find Item in Other Sheets and Models...	
Links	▶
Scene	▶
Viewpoint	▶
Hide	Ctrl+H
Require	Ctrl+R
Hide Unselected	
Override Item	▶
Reset Item	▶
Units and Transform...	
Selection Inspector...	

Scene View—When you right-click in the Scene View, without an item selected, you will get a menu that contains some of the basic tools that control the appearance of the scene or the Scene View in general (see [Figure 2.33](#)). This menu will give you quick access to a few of the tools that control the Scene View without having to navigate through tabs or dialogs.

FIGURE 2.33

The Scene View menu

Selected Items—After selecting an item, when you right-click you will get a menu that contains some of the basic tools that help you manage the item selected (see [Figure 2.33](#)).

This menu will give you quick access to a few of the tools that will help you manage the selected item without having to navigate through tabs or dialogs.

FIGURE 2.34

The Scene View menu

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SCENE VIEW NAVIGATION

When working on your project model on your computer screen, you will need more than just the standard Windows scroll bars to navigate through your model. You will need to change the magnification of the project model and frequently scroll other parts of the model into view. The act of changing the magnification of the screen is referred to as “zooming,” and moving the image on screen within the borders of the Scene View to see other parts that are off your screen is referred to as “panning.”

Mouse wheel navigation—If you have a mouse with a middle wheel button, Navisworks will provide you the ability to Zoom, Orbit, or Pan using the wheel. If you don’t have a wheel mouse, this might be a good time to get one. This modest investment in hardware will pay for itself in time saved and increased productivity by the end of the first day of usage. We will discuss the Zoom, Orbit, and Pan tool later in this section.

NAVIGATION BAR

The Navigation Bar is a small toolbar with navigation commands that can be used in the Scene View (see [Figure 2.35](#)). By default, the Navigation Bar is located in the upper right corner of the Scene View.

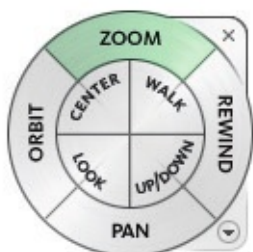
FIGURE 2.35

The Navigation Bar

By default the Navigation Bar is linked to the ViewCube. The ViewCube will always be found in the upper-right hand corner of the Scene View. The Navigation Bar cannot be linked to the ViewCube allowing it to be repositioned along any edge of the Scene View. The Navigation Bar can only be positioned along an edge of the Scene View. To unlink the Navigation Bar from the ViewCube simply select the Navigation Bar drop-down, select the Docking Position fly-out and then click: Link To ViewCube. This gives you the ability to move the Navigation Bar. To re-link the Navigation Bar select the Navigation Bar drop-down, select the Docking Position fly-out and then click Link To ViewCube.

The Navigation Bar includes several tools:

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Zoom from the click position. Press shift for zoom window.

ViewCube—The ViewCube, when active, indicates the current orientation of the project model. When active, the ViewCube is visible above the Navigation Bar in the Scene View ([see Figure 2.36](#)). By default, the ViewCube is located in the upper right corner of the Scene View.

FIGURE 2.36

The ViewCube

The ViewCube can be used to quickly reorient the Scene View to a different view without having to Zoom, Pan, or Orbit in the Scene View. Click a predefined area or location on the ViewCube to reorient your model to that particular view. In addition, the Compass, located directly below the ViewCube, allows you to reorient the Scene View based on a compass direction or you can click and drag the compass ring to rotate the model around a point. Right-click the ViewCube to restore your Home view, change to a Perspective or Orthographic view, and access other options.

When inactive, an icon appears on the Navigation Bar to activate it. To return the ViewCube to the Navigation Bar on the View ribbon tab, on the Navigation Aids panel, click the ViewCube button. This will return the ViewCube to the Navigation Bar.

Steering Wheel—The Steering Wheel offers an alternative approach to navigation. Click the Steering Wheel icon to make the Steering Wheel appear in the Scene View. To use a function on the steering wheel, place your mouse over the item and drag ([see Figure 2.37](#)).

FIGURE 2.37

For example, if you wish to zoom, move the wheel to the area of the screen that you wish to zoom in or out from, click and hold down the left mouse

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button to begin to zoom. Release the mouse button to stop zooming and make the steering wheel reappear.

As you perform zooms they are stored in memory. You can use the Rewind function to back up through previous zooms in an interactive and visual way.

Move your mouse pointer over the Rewind function, click and hold down. A rewind ribbon will appear that represents a previous zoom. Click to highlight a previous zoom. Release the mouse to stop rewinding or forwarding to previous zooms. When you are done with the wheel, click the small close box (“X”) in the upper right corner of the wheel or press ESC.

Pan—Push and hold the mouse wheel down and then drag the mouse in any direction to move (Pan) the Scene View in that direction. Hold down the SHIFT to temporarily switch to Orbit.

Zoom—The Zoom tool drop down provides a set of zoom tools that allows you to increase or decrease the magnification of the current view.

Zoom Window—Click and drag a box over an area in the Scene View to zoom into. This can be repeated several times, if needed, in order to zoom to the desire location or level of detail.

Zoom—Click a location in the Scene View to act as the focal point of the center of the zoom and then roll the mouse wheel up to zoom in (closer) or roll the mouse wheel down to zoom out (farther away).

TIP: The Center tool allows you to define the center, focal point, of a current view of your project model. This defines the focal point for Zoom and the pivot point for Orbit. The Center tool can be accessed from one of the Navigation wheels. Simply click and hold down the Center tool, drag your cursor to the desired location, and release the mouse button.

Zoom Selected—Zoom to the item(s) selected in the Scene View. Press PAGE DOWN to zoom directly to the selected items.

Zoom All—Zoom the whole project model to fit in the Scene View. Press PAGE UP to zoom to fit the model in the Scene View.

TIP: If you get “lost” in your project model, either inside or even outside the model, press PAGE UP to return to a known “starting point”.

Orbit tools—The Orbit tool drop down provides a set of orbit tools that allows you to rotate the model around a pivot point while the view frame remains in a fixed location.

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Orbit—Hold down the left mouse button to Orbit about the focal point of the project model. Drag the mouse in any direction to Orbit correspondingly. Press CTRL to relocate the focal point of the Orbit in the Scene View. The Orbit will then be constrained about the new focal point.

Free Orbit—Hold down the left mouse button to Orbit about the focal point in any direction. Drag the mouse in any direction to Orbit correspondingly. Press CTRL to relocate the focal point of the Orbit in the Scene View. Free Orbit does not maintain the up direction (Y-direction).

Constrained Orbit—Hold down the left mouse button to Orbit about the

focal point in a side-to-side manner. In essence your model moves as if it were spinning on a turntable or potter's wheel, if you will. Press CTRL to relocate the focal point of the Orbit in the Scene View. The project model will always be rotated around the Y-direction.

Look tools—The Look tool drop down provides a set of tools that allow you to look around your model either vertically or horizontally.

Look Around—Hold down the left mouse button to Look Around the model in any direction. Drag the mouse in any direction to Look Around correspondingly.

Look At—Click an item in the project model to set the focal point and zoom to the item selected.

Focus—Click an item in the project model and the point clicked will become the focal point in the Scene View. The Scene View moves accordingly.

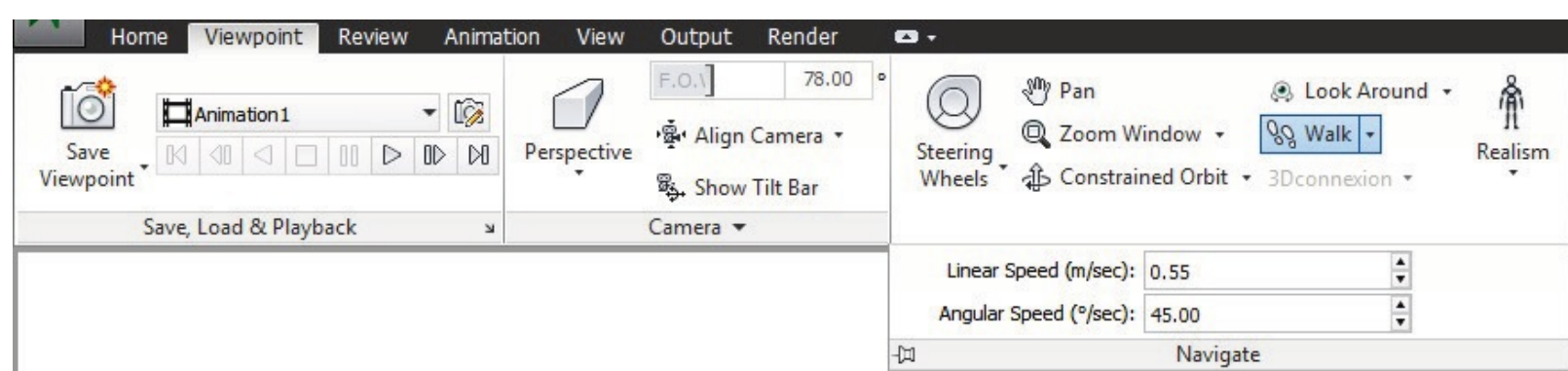
Walk and Fly tools—The Walk and Fly drop down provides a set of tools that allow you to navigate through your project model and to control the Third Person or realism settings.

Walk—Click to begin walking through the project model. Once the Walk tool is active the cursor appears as pair of shoes in the Scene View indicating that the Walk tool has been invoked. Hold down the left mouse button and move the mouse in any direction to Walk correspondingly.

Press SHIFT to increase the speed of the Walk. Press CTRL to temporarily switch from Walk to Pan. Once the Walk tool is active the Collision, Gravity, Crouch, and Third Person tools can be used. We will discuss those tools in later chapters.

Fly—Click to begin flying through the project model. Once the Fly tool is active the cursor appears as an airplane in the Scene View indicating that the Fly tool has been invoked. Hold down the left mouse button and move the mouse in any direction to Fly correspondingly. Press SHIFT to increase the speed of the Fly. Once the Fly tool is active the Collision, Crouch, and Third Person tools can be used. We will discuss those tools in later chapters.

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Note: Navisworks includes 3D Connexion device support. If you have one of these devices connected to your computer, you can use it to navigate in the Scene View. An additional icon will appear on the Navigation Bar indicating that the device is detected and available for use in Navisworks.

To remove a tool from display on the Navigation Bar, select the Navigation Bar drop-down and then click the tool you do not wish to display on the Navigation Bar. To display a tool on the Navigation Bar that is not currently displayed, select the Navigation Bar drop-down and then click the tool you wish to display on the Navigation Bar.

Although we discussed the tools found on the Navigation Bar, the same set of tools can also be located on the Viewpoint tab on the Navigate panel. The Linear and Angular Speed can also be controlled by clicking the Navigate panel drop down ([see Figure 2.38](#)).

FIGURE 2.38

Navigation Bar tools can also be found on the Ribbon

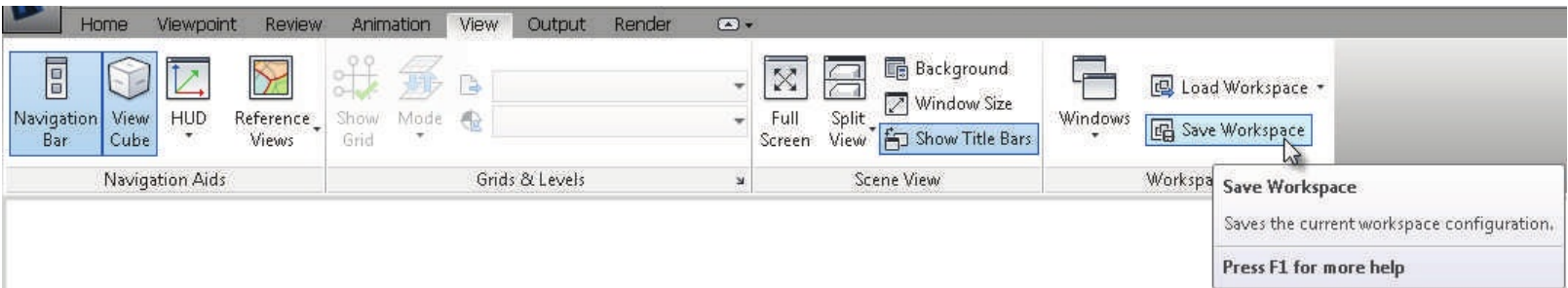
Additional navigation tools will be discussed in the coming chapters.

SELECTION METHODS

Before properties can be reviewed in Navisworks an item must be selected. As previously discussed in the text above, only the properties of a single item will be displayed. When multiple items are selected the properties will not be displayed in the Properties window rather a total count of the items will be displayed. There are two methods used to select items.

The simplest way to select an item is to use the Select tool and click on it. When you select an item it will display in a predetermined color, as set in the Options Editor (magenta by default), indicating that the item has been selected. Once selected, the item will remain selected until you deselect it. You can deselect an item in three different ways. You can select

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another item which will automatically deselect your current selection (unless you hold the CTRL key) and it will become the new selection. You can deselect the item without creating a new selection by clicking on a blank portion of the screen, where there are no items, or you can simply press the ESC key.

To create a selection containing more than one element, you can use the Selection Box or

you can use one the following techniques:

Hold the CTRL key while clicking on another item. The new item will be added to the current selection, and highlight as well.

Hold the SHIFT key while selecting multiple items in the Selection Tree. If you hold the SHIFT key while selecting an item on your project model it will select all items associated with the model.

WORKSPACE

Earlier, in the Options topic above, we briefly touched on how to export and import your Navisworks settings to help reduce some set-up time in a shared environment. The same export and import option exists for your Workspace. When you save your Workspace you save information regarding which windows are open, their position and their size.

Workspace's save information pertaining to the QAT and the Ribbon only.

To save your Workspace, on the View tab, on the Workspace panel, click the Save Workspace button ([see Figure 2.39](#)).

FIGURE 2.39

Save your QAT and Ribbon settings with the Save Workspace tool

In the “Save Current Workspace” dialog, navigate to the location where you wish to save your Workspace settings, type a name for your Workspace settings file, and then click Save.

To load a saved Workspace, on the View tab, on the Workspace panel, click Load Workspace drop-down and then choose: More Workspaces ([see Figure 2.40](#)).

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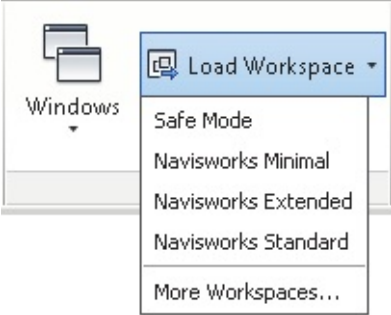


FIGURE 2.40

Load your saved Workspace with the Load Workspace tool

In the Load Workspace dialog, navigate to the location where your Workspace has been saved, select your saved Workspace file, and then click Open.

Note: When loading a Workspace the Navisworks splash screen will appear like the product is initially opening. This is just part of the process and no work will be lost when this occurs.

Navisworks also has four pre-configured Workspaces available. They can be loaded through the Load Workspace drop-down as well. They are:

Safe Mode—A configuration having the Ribbon and panels visible, the Select tool active (Home tab, Select & Search panel), the Selection Tree window open and pinned (Home tab, Select & Search panel), the Properties window open and pinned (Home tab, Display panel), the Saved Viewpoints dialog open and pinned (Viewpoint tab, Save, Load & Playback dialog launcher), the Tilt Bar window open and pinned (Viewpoint tab, Camera panel), the View Comments window open and pinned (Review tab, Comments panel), and the Plan View window open and pinned (View tab, Navigation Aids panel (Reference Views drop-down)).

Navisworks Minimal—A configuration only having the Ribbon and panels

visible. No other windows or dialogs open.

Navisworks Extended—A configuration for the Advanced Navisworks user who uses Navisworks to its fullest extent. In this configuration the Ribbon and panels visible, the Select tool active (Home tab, Select & Search panel), the Selection Tree window open and pinned (Home tab, Select & Search panel), the Find items window open and unpinned (Home tab, Select & Search panel), the Sets window opened and unpinned (Home tab, Select & Search panel), the Properties window open and pinned (Home tab, Display panel), the Clash Detective window open and unpinned (Home tab, Tools panel), the Time Liner window open and unpinned (Home tab, Tools panel), the Quantification Workbook window open and unpinned (Home tab, Tools panel), the Clash Detective window open and unpinned (Home tab, Tools panel), the Animator

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window open and unpinned (Home tab, Tools panel), the Scripter window open and unpinned (Home tab, Tools panel), the Saved Viewpoints dialog open and pinned (Viewpoint tab, Save, Load & Playback dialog launcher), the Tilt Bar window open and pinned (Viewpoint tab, Camera panel), the Measure Tools dialog open and unpinned (Review tab, Measure Options dialog launcher), the View Comments window open and unpinned (Review tab, Comments panel), and the Plan and Section View window open, pinned and grouped (View tab, Navigation Aids panel (Reference Views drop-down)).

Navisworks Standard—The exact same windows and dialogs as outlined in the Navisworks Extended Workspace setting above will be opened and unpinned with the exception that the Tilt Bar and Plan and Section View

windows will not be opened at all in this configuration. The Ribbon and panels will be visible as well.

Note: If you want to make a back-up copy of the default Workspace configuration before user modifications occur you can locate the XML file here: *%Appdata% > Autodesk Navisworks Manage 2014 > LastSession.XML*.

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SUMMARY

Now that you have an idea of the overall layout of the Navisworks user interface, some understanding on how to navigate through the Scene View and learned about some global Option settings that will impact the Navisworks product, you are now ready to begin exploring more Navisworks tools in the chapters that follow.

The QAT, above the ribbon, can store frequently used tools for ease of access.

The ribbon along the top of the screen contains several tools organized into tabs. Each ribbon tab is divided into panels.

Tools come in three varieties: buttons, drop-down buttons, and split buttons.

The Scene View can be split multiple times either vertically or horizontally.

The Selection Tree is like a “table of contents” for your project.

The Status Bar can give you feedback on the performance of Navisworks or your project model.

Context-sensitive right-click menus contain many common commands.

Roll the mouse wheel to zoom, drag the wheel to pan, hold the SHIFT key to orbit.

Select items with the Selection tool, use the CTRL key to add to the current selection, and use the SHIFT key to add multiple items to the selection.

Once established, a Workspace can be saved and then imported to help reduce time consuming set-up.

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Chapter 3

Global Settings and File Options

INTRODUCTION

This chapter explores settings and variables. This includes both the global settings that will affect the Navisworks product environment regardless of the user or project file(s) opened, and also file options that only impact your Navisworks project file currently active. Examples of global settings include the Auto-Save file location and the frequency of time between Auto-Saves. A global setting will affect all Navisworks users. The simplest way to remember a global setting is that it is any setting contained in the Options Editor dialog. On the other hand, Frame Rate, (as you are navigating through the model), will only apply to the current project file. File settings are typically configured with the File Options tool. The settings you choose are often based on your own company standards. Also keep in mind that both global settings and file options can affect the performance of your Navisworks product and your project files.

This chapter is a reference chapter and not a tutorial. If you are anxious to get to the step-by-step instructions, you can skip this chapter for now and return to it later.

OBJECTIVES

This chapter will acquaint you with the global settings that impact the Navisworks product as a whole and all the users using the product. You will also explore file options that impact only your current project file. Topics we will explore include:

- Global settings that impact all Navisworks users.
- File options that are stored with Navisworks project files.

GLOBAL SETTINGS

There are many global settings available for us to configure in Navisworks. We explored a

few examples in the previous chapter. Many global settings can affect your product and/or model performance. This chapter will focus on settings that affect performance to help you become more successful using the Navisworks product or navigating through your project

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model. Some settings can be established based on your company standards. So please be sure to check with your BIM Manager before making changes to global settings to ensure that options we discuss here are in compliance with your established company standards. Since all of the settings discussed in this topic are global in nature you can typically set them once and then forget about them regardless of the current user or the project file that is opened.

However, in certain cases, global settings might need to be adjusted and saved based on project standards or a particular project configuration. So be sure to discuss this with your project teams before proceeding.

Global settings make it easy for BIM managers to ensure that Navisworks settings will be the same for all users or all machines. Global settings can be exported and then imported into other computers in order to be shared with all users.

Note: Certain global settings can be locked to prevent users from editing them on local machines. To do this you will need to run the stand-alone Options Editor in administrator mode. You can do this by typing:

"drive:pathname\OptionsEditor.exe" at the command line or you can click

Start > All Programs > Autodesk > [product name] > Options Editor (Administrator Mode). The Options Editor will open the locking tool. Click the padlock icon to lock the

associated global setting. When finished, click the Export button to create a locked global settings file that can be imported by other Navisworks users.

In the previous chapter, we discussed the export and import of settings through the Options

Editor dialog. As you work through this chapter, if you make any changes in the Options Editor it is recommended that you export your settings again. If you are unclear on how to export your settings please refer to the [“Options”](#) topic in [Chapter 2](#).

GENERAL SETTINGS

Let’s take a look at the Options Editor. To open it, from the Application menu, choose Options (at the bottom of the menu). Within the “Options Editor” dialog, in the tree window expand General ([see Figure 3.1](#)).

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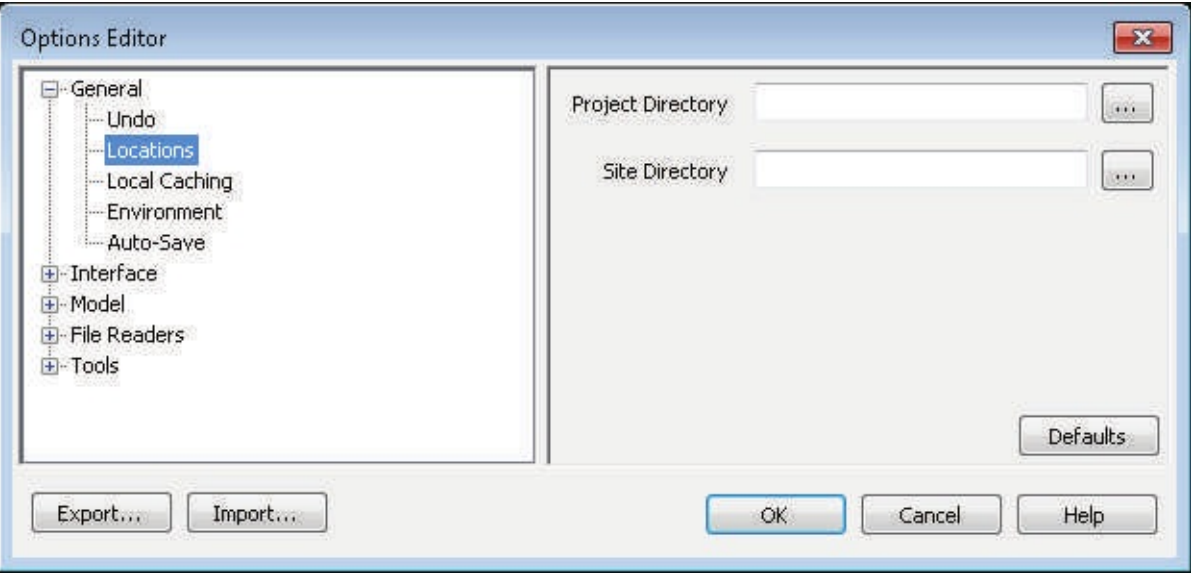
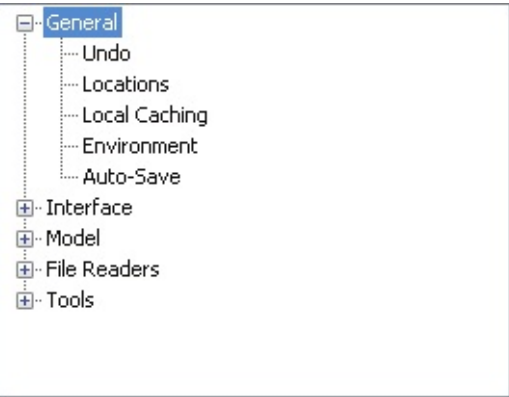


FIGURE 3.1

A few of the General Options that you should review before using Navisworks

Within the General Options, we are going to focus on the Locations, Environment, and

Auto-Save Options. Selecting Locations allows you to input folder locations to share the global settings in Navisworks: Workspaces, avatars, Clash Detective rules, Presenter achieves, object animation scripts, etc. with other Navisworks users (see [Figure 3.2](#)).

FIGURE 3.2

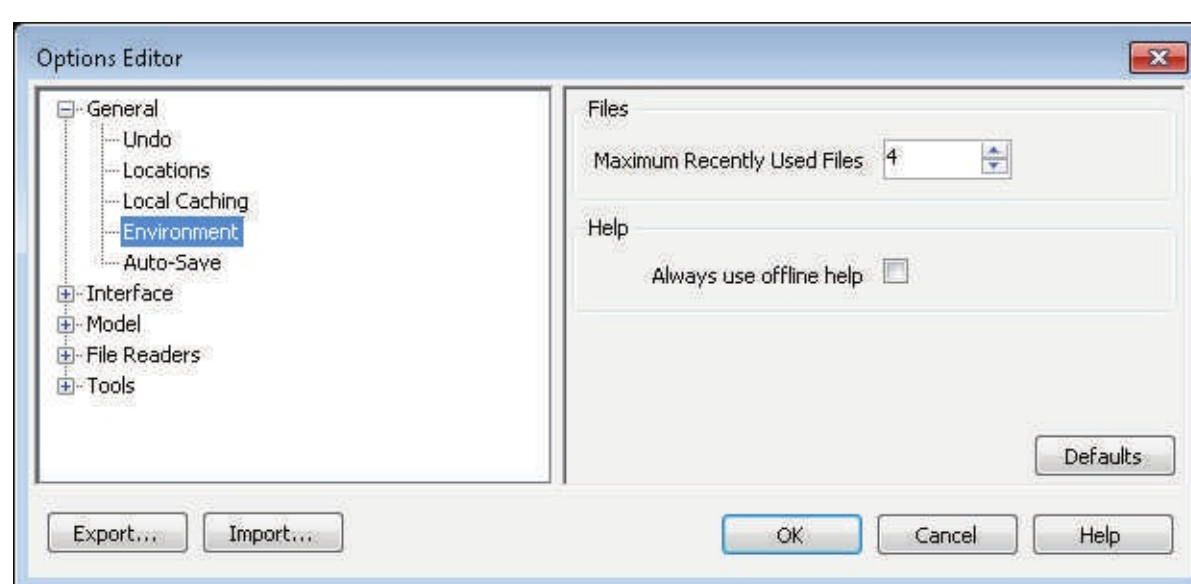
Use the Location Options to specify folder paths

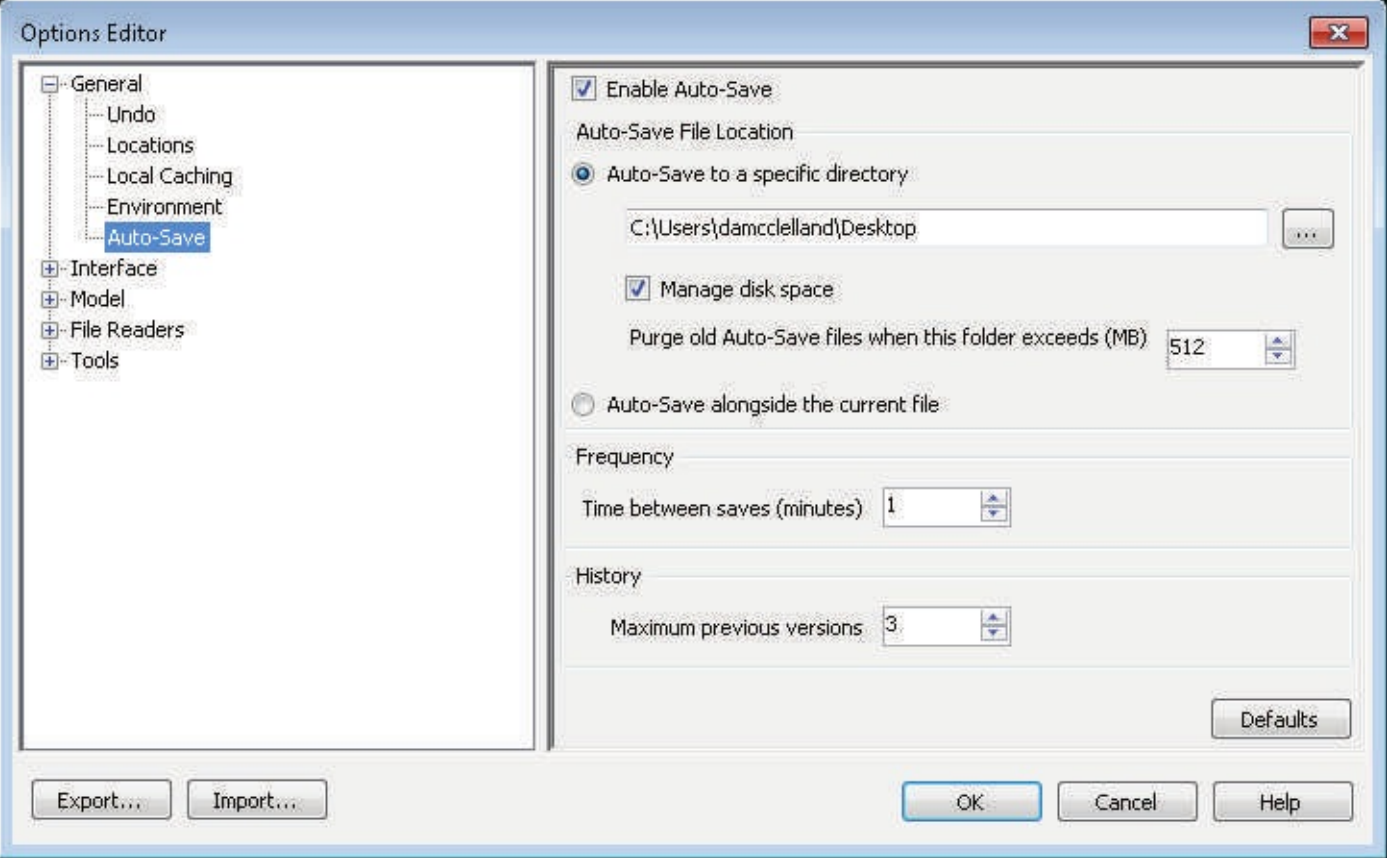
Note: When the Navisworks product is run for the very first time the global settings are taken from the Autodesk installation folder found on the local drive. After the product is run initially, Navisworks will then compare all users' profiles on the local machine against the global settings found in the Project and Site Directory. If there are any discrepancies, the global settings from the Project Directory will take precedence.

Project Directory—The Project Directory allows you to share global options. Click the browse button to the right to open the “Browse for Folder” dialog. Browse to the folder containing the Navisworks settings that will be specific to a project group.

Site Directory—The Site Directory allows you to share global options. Click the browse button to the right to open the “Browse for Folder” dialog. Browse to the folder containing the Navisworks settings that will standard to all users of the Navisworks product at your site.

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Select the Environment branch next. Here, under Files, we can say how many recent files we want to display in the in the Recent Documents list in the Application Menu (see [Figure 3.3](#)).

FIGURE 3.3

Control the maximum recent files displayed with the Environment Options

Maximum Recently Used Files—This is set to 4 by default. The maximum number of files that can be displayed is 16 while the minimum is 1. 4 is the default.

Select the Auto-Save option next. Several options related to automatic saving are presented here (see [Figure 3.4](#)).

FIGURE 3.4

The Auto-Save Options

Enable Auto-Save—Select this checkbox to have Navisworks automatically save your project files. By default this checkbox is selected. When Enable Auto-Save is deselected the items below this checkbox are unavailable. It is recommended that you leave this checked.

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Auto-Save File Location—Assign a specific folder location to the Auto-Save or choose to Auto-Save alongside the current file. Auto-Save to a specific directory is the default.

Manage disk space—Restrict the total amount of disk space allocated for the creation of the Auto-Save back-up files. Purge old Auto-Save files if the size of the folder exceeds a particular size (in MB). By default the Manage Disk Space checkbox is selected and 512 MB is the default value where Auto-Save files will begin to be purged.

Note: When the Auto-Save alongside the current file radio button is selected the Manage Disk Space and Purge Old Auto-Save files options are no longer available for selection.

Frequency—Specify the time between Auto-Saves in minutes. 15 minutes is the default and is based on a significant file change. For example, if Auto-Save is set for 15 minutes and you simply open the file and do nothing in the file for 20 minutes an Auto-Save file will not be created.

History—Specify the total number of Auto-Save files that will be created and stored. 3 is the default. When the total number of Auto-Saves files is exceeded Navisworks will delete the oldest Auto-Save file. This will be based on the date modified.

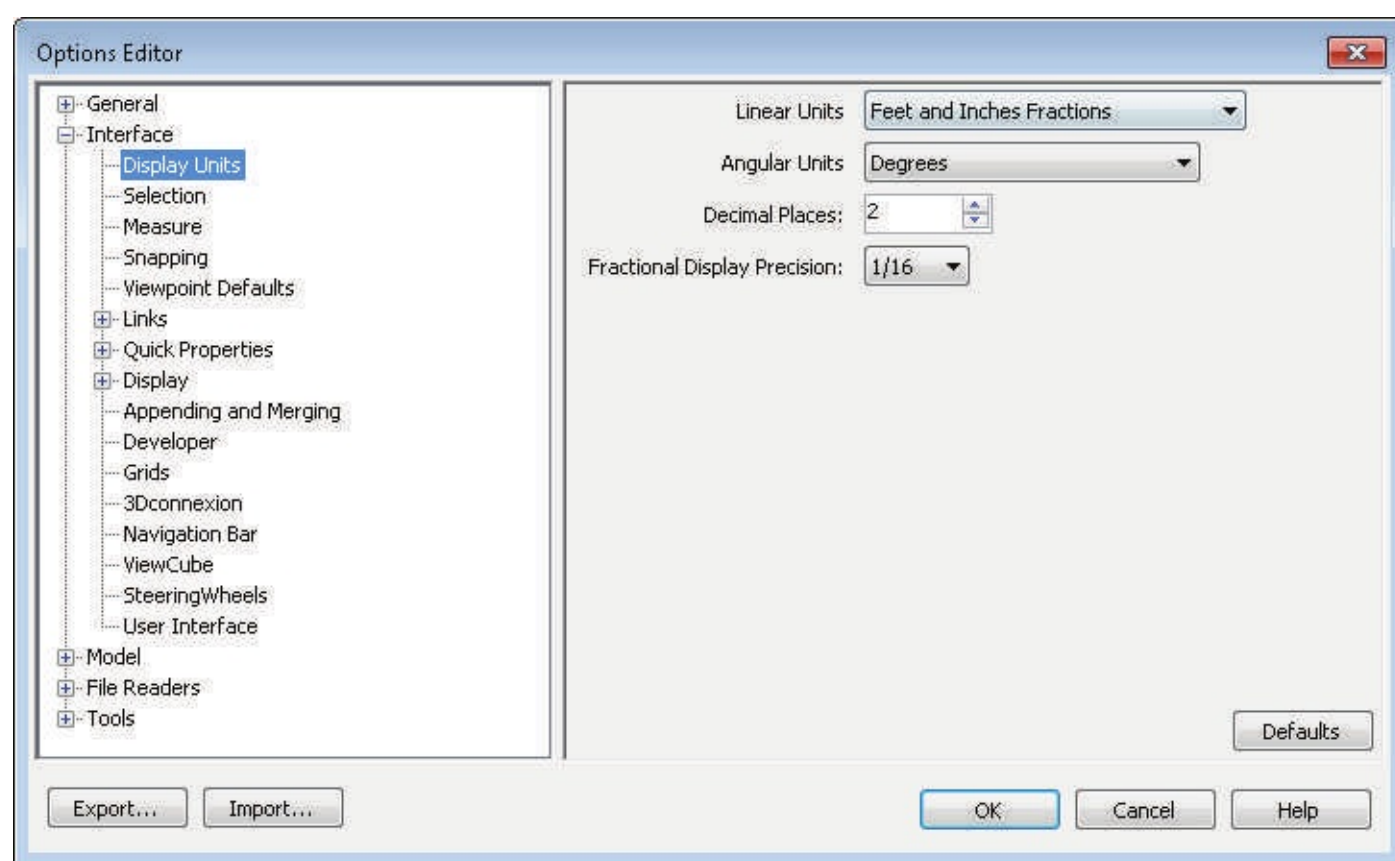
INTERFACE SETTINGS

Our next stop in the “Options Editor” dialog will be the Interface branch. There are quite a few items here. Some even have sub-items of their own ([see Figure 3.5](#)).

FIGURE 3.5

Many options can be customized for your Navisworks interface

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We are going to focus on several options; in particular: Display Units, Selection, Measure, Snapping, Quick Properties, Grids, and User Interface.

Display Units—This option let’s you choose your preference in units of measure ([see Figure 3.6](#)).

FIGURE 3.6

Display Units gives options for unit of measure and precision

There are two unit options here: choose your preference for linear units and for angles.

Linear defaults to Meters but can be changed to any common unit of measure. Angular defaults to Degrees only, but can also Degrees with Minutes and Seconds or Radians. If you choose a Feet or Inches, the “Fractional Unit Display Precision” option will become enabled.

Selection—Several options are available in this branch to customize the behavior when selecting objects and the use of the Selection Tree ([see Figure 3.7](#)).

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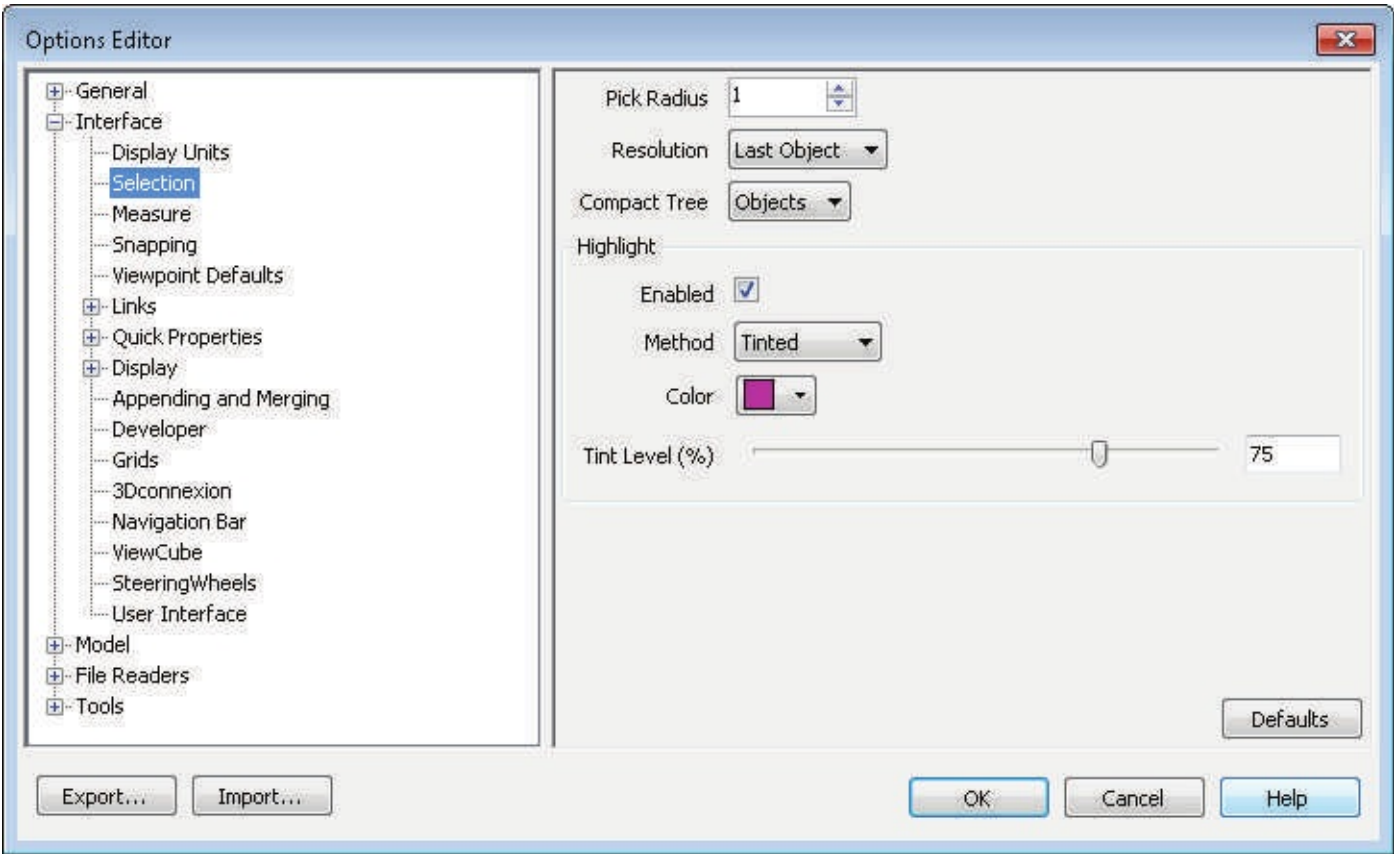


FIGURE 3.7

Selection options control a variety of selection behaviors

When “Compact” view has been chosen in the Selection Tree view drop-down, you will have three options for how items are listed: Model, Layers, or Objects.. Layers is the default. (See the [“Selection Tree”](#) topic in [Chapter 2](#) for additional information).

Models—The Selection Tree will only display model files.

Layers—The Selection Tree can be expanded down to the layer level.

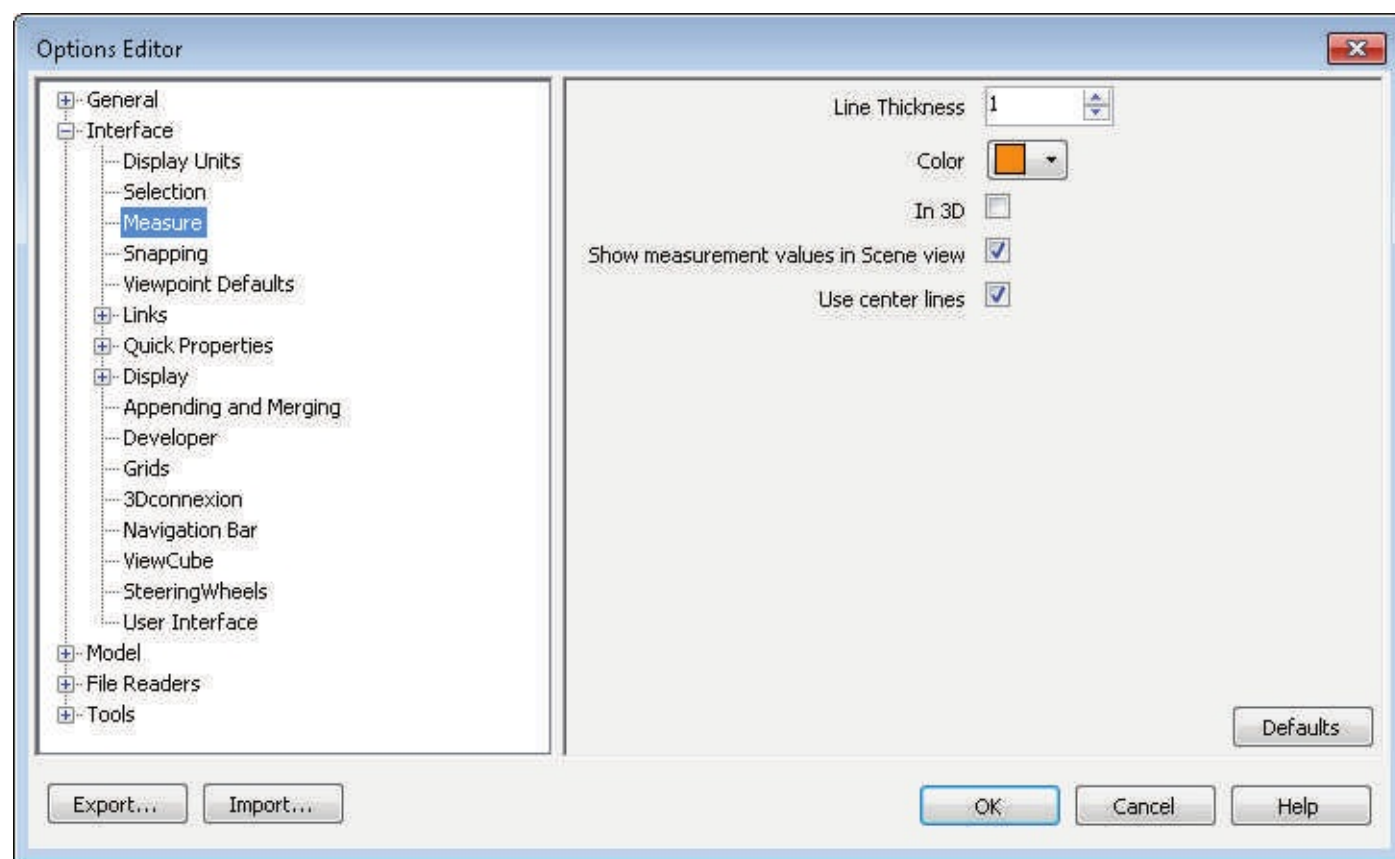
Objects—The Selection Tree can be expanded down to the objects level, but

without the levels of instancing shown on the Standard view.

With the Highlight settings, you can customize the onscreen graphical rendition of selected objects. Use the Color drop-down to assign the desired color to the selected object. Magenta is the default color. If you wish, you can change it to match other products that your team is using. This can help you visually train your users to identify selected items in the same manner across several different software products.

Measure—Gives you settings that control the look of your dimensions in Navisworks ([see Figure 3.8](#)).

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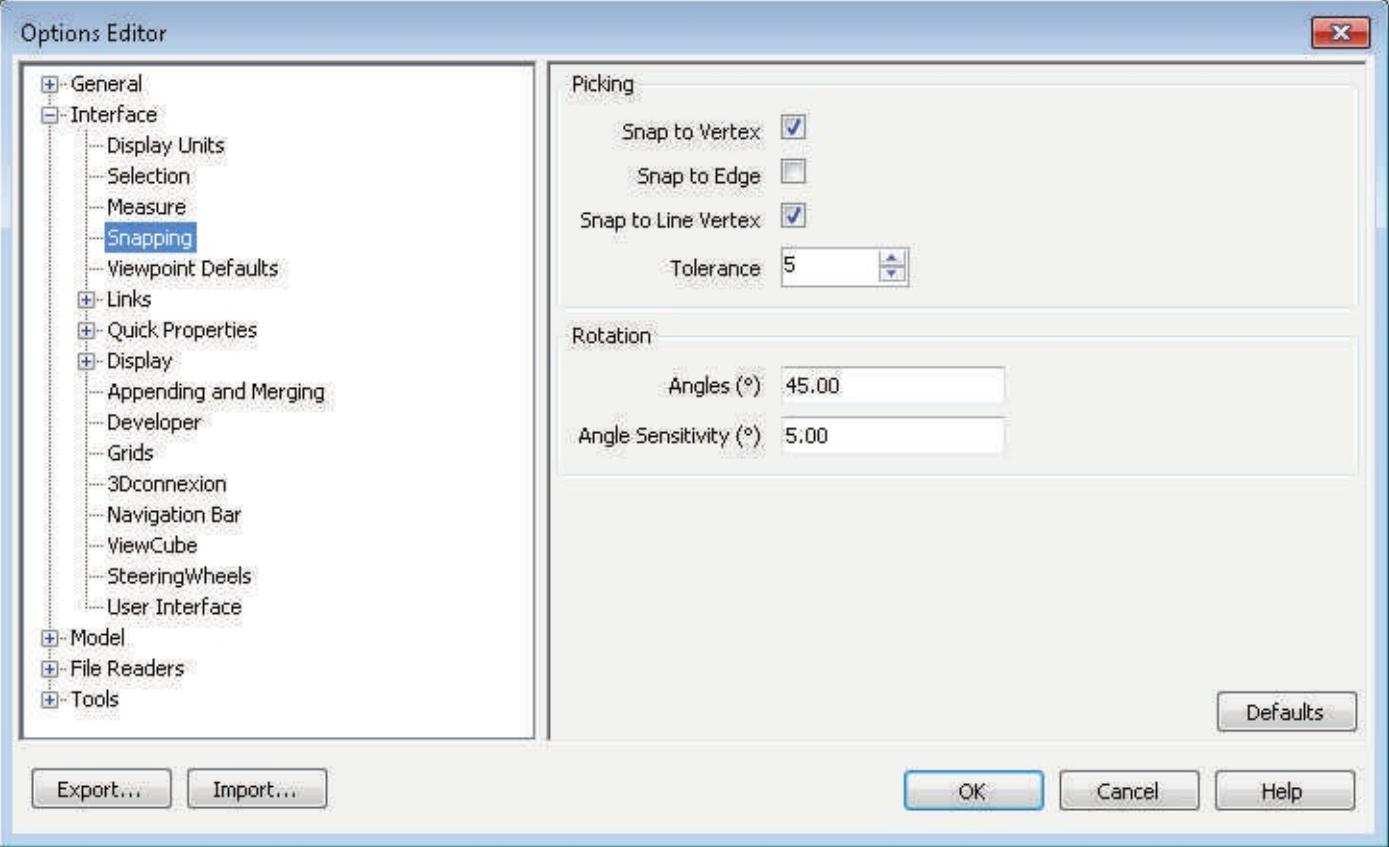


FIGURE 3.8

The Measure Options in Navisworks

Use Line Thickness to specify the onscreen thickness of the dimension lines shown in Navisworks. 1 is the default. Use Color to select the color of the dimension lines onscreen.

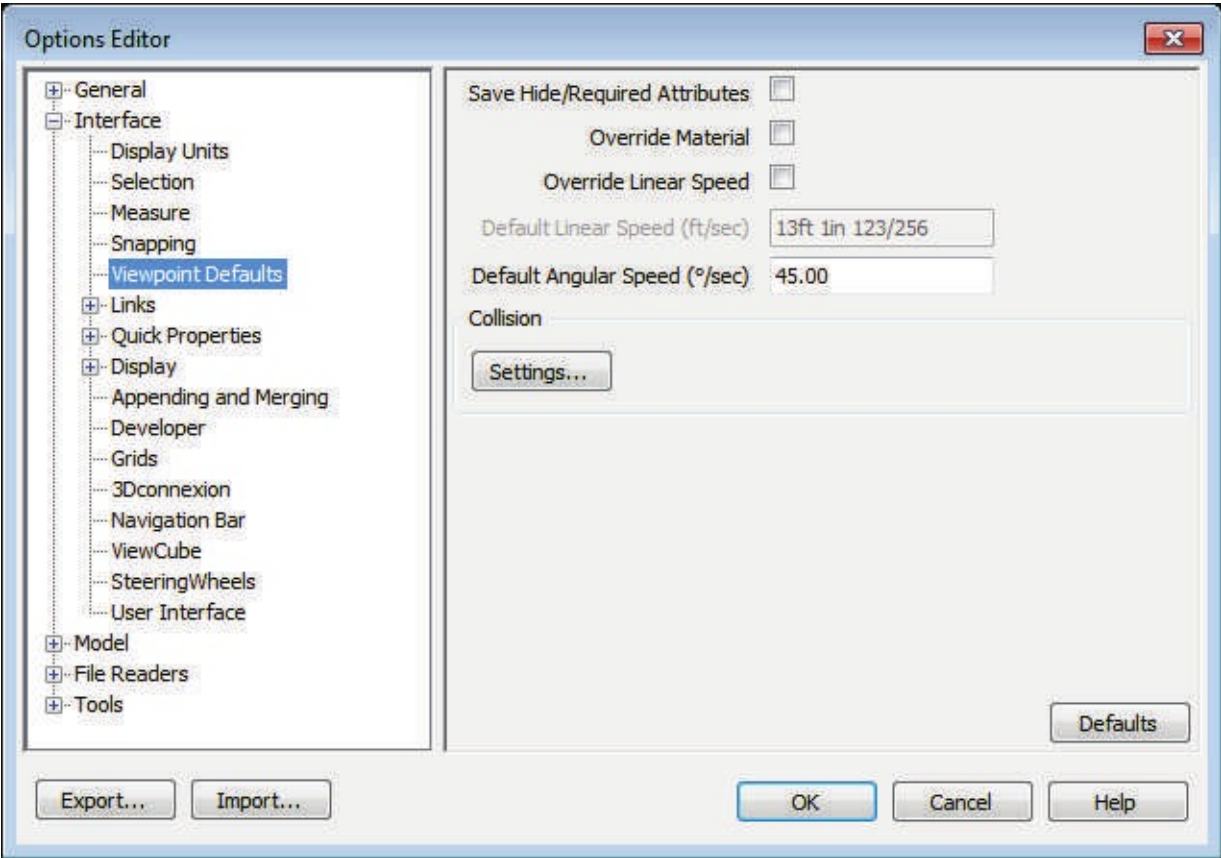
Orange is the default.

Snapping—Snap points are critical when measuring items in Navisworks. Here you can change your preferences for snap point locations ([see Figure 3.9](#)).

FIGURE 3.9

Snapping Options

Under Picking, Snap to Vertex and Snap to Line Vertex are set as the default. You can also choose Snap to Edge.



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TIP: Navisworks geometry is constructed with triangles. This might cause some unexpected picks when snapping to objects and that can lead to errors when measuring. If you do not believe that you have snapped to the correct point or you cannot find an adequate point to snap to, change your Mode (Viewpoint tab, Render Style panel) to Hidden Line.

This will expose the snap points the measuring tools can snap to.

Viewpoint Defaults—As you work in Navisworks, you will create Viewpoints which can contain camera positions, sections, Redlines, Comments, Tags, etc. The settings here allow you to apply your preferences automatically to new Viewpoints ([see Figure 3.10](#)).

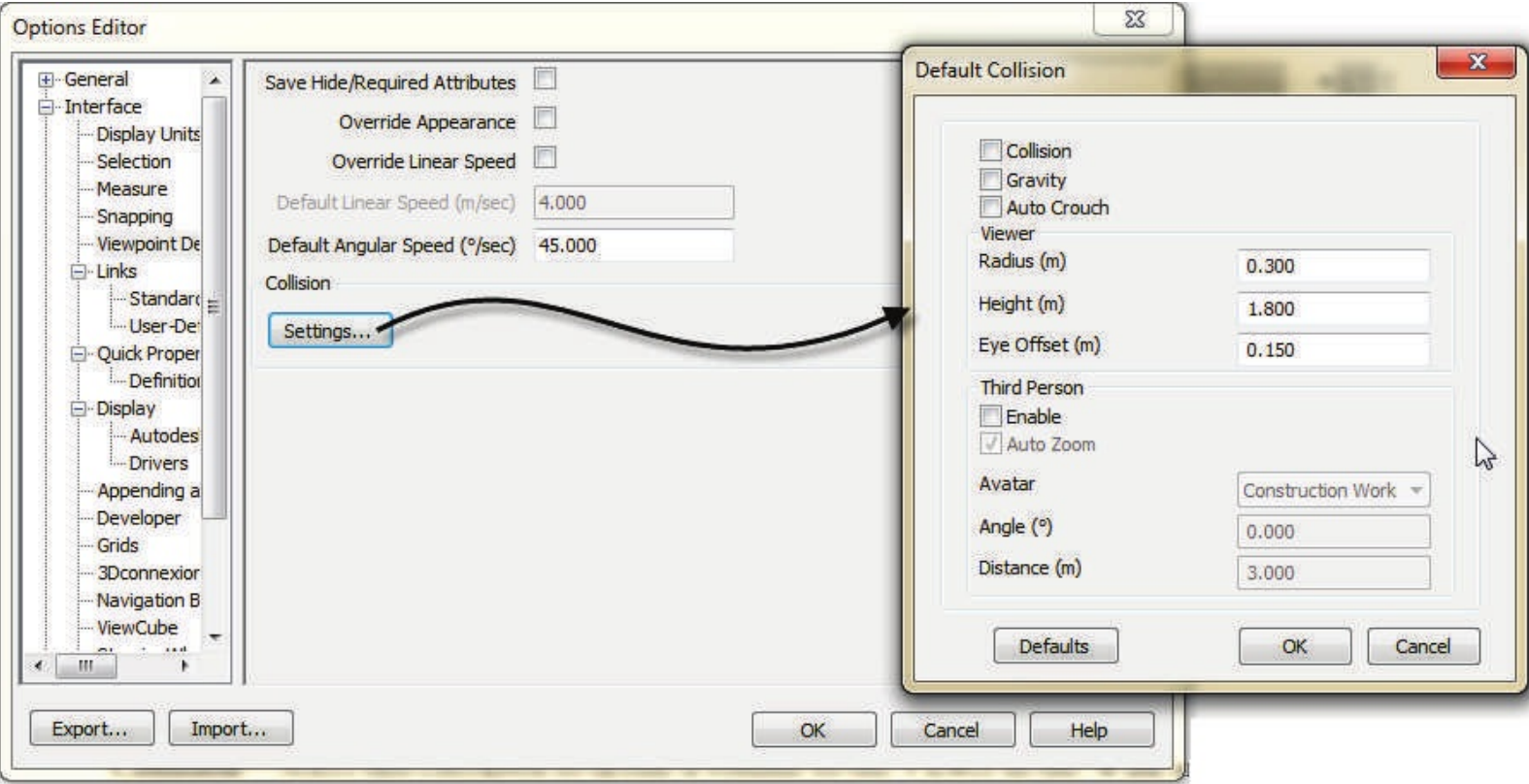
FIGURE 3.10

Viewport Default Options apply a standard to newly created Viewpoints If the Viewpoint Defaults settings are modified the changes will only affect any new Viewpoints saved in the Navisworks file that is currently open or in any future sessions of Navisworks. The new settings will not be applied to Viewpoints that have been created or previously saved.

Save/Hide Required Attributes—Select this checkbox to save the all Hidden and Required items in the Viewpoint as you save the Viewpoint. This means that when a Viewpoint is displayed again all the items that were Hidden will still be hidden. This option is not selected by default since when selected this option requires more hardware resources to save the information with the Viewpoint. It is recommended that you perform your own hardware tests to determine if it is practical to enable this option. If you

hardware is suitable, it is recommended that you enable this option.

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Override Material—Select this checkbox to save the material overrides in the Viewpoint as you save the Viewpoint. This means that when a Viewpoint is displayed again all the material overrides will be displayed again. This option is not selected by default since when selected this option requires more hardware resources to save the information with the Viewpoint.

Override Linear Speed—Select this checkbox to specify a specific speed to navigate through the project model. This option is not selected by default.

Once selected the Default Linear Speed can be adjusted to suite your project needs.

Default Angular Speed—Select any number of degrees per second that the camera will turn. The default is 45.

Under Collision there is a Settings button. Click this button to specify the Collision settings for the Viewpoint. By default Collision, Gravity, Auto Crouch, and Third Person are not selected (see [Figure 3.11](#)).

FIGURE 3.11

Collision Settings in the Viewport Defaults **Collision**—Select this checkbox to define a volume to the Viewer in the Walk and Fly modes. When Collision is selected the Viewer cannot pass through objects,

etc. This makes walk and fly more realistic.

Gravity—Select this checkbox to fix the Viewer to a horizontal surface in order to avoid walking through floors, etc. This makes walking more realistic.

Auto Crouch—Select this checkbox to enable the Viewer to crouch under low items in Walk mode. This makes walking more realistic.

The best way to think of the Viewer is to picture yourself in your project model. Transpose your width, height, and eye level to these settings in order to put yourself in the project model. This becomes the collision volume when Collision is selected.

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Radius—Enter the radius of the Viewer here. Perhaps, you don't think of yourself this way, but if you imagine the radius emanating from the center of your chest, that might help visualize what this size represents. If you wanted to imagine walking with your arms outstretched, change the radius to much larger setting.

Height—Enter the height of the Viewer here. You will want to choose an “average” height here. You can also choose to input a maximum height in some cases. It depends on what you are testing for.

Eye Offset—Enter the distance *below* the Height of the collision volume that the camera will view from if Auto Zoom is selected. This helps make the view more realistic.

Third Person allows you to place an Avatar in the Scene View to graphical represent an individual and their spatial relationship to the project model. This also provides a graphical representation of movement through the model as well. The size of the Avatar is based on the Viewer Radius, Height, and Eye Offset. A viewing distance between the camera and the Avatar can also be provided.

Enable—Select this checkbox to use the Third Person view. In Third Person view an Avatar is added to the Scene View to represent the Viewer.

Auto Zoom—Select this checkbox to automatically switch from the Third Person whenever a line of vision becomes obstructed.

Avatar—When Third Person is enabled use the Avatar drop down to select the Avatar you wish to place in the Scene View.

Angle—Specify an angle which the camera will look at the Avatar. For example entering 45 will make the camera look down on the Avatar from a 45 degree angle.

Distance—Specify the viewing distance between the camera and the Avatar.

When you are finished in the “Default Collision” dialog, click OK to dismiss it. You can also click the

Defaults button at the bottom to restore the factory default settings. If you don't want to save your changes, simply click Cancel.

Quick Properties—This option will show Quick Properties as you hover over items in Navisworks. (see [Figure 3.12](#)). This will be in the form of a tooltip.

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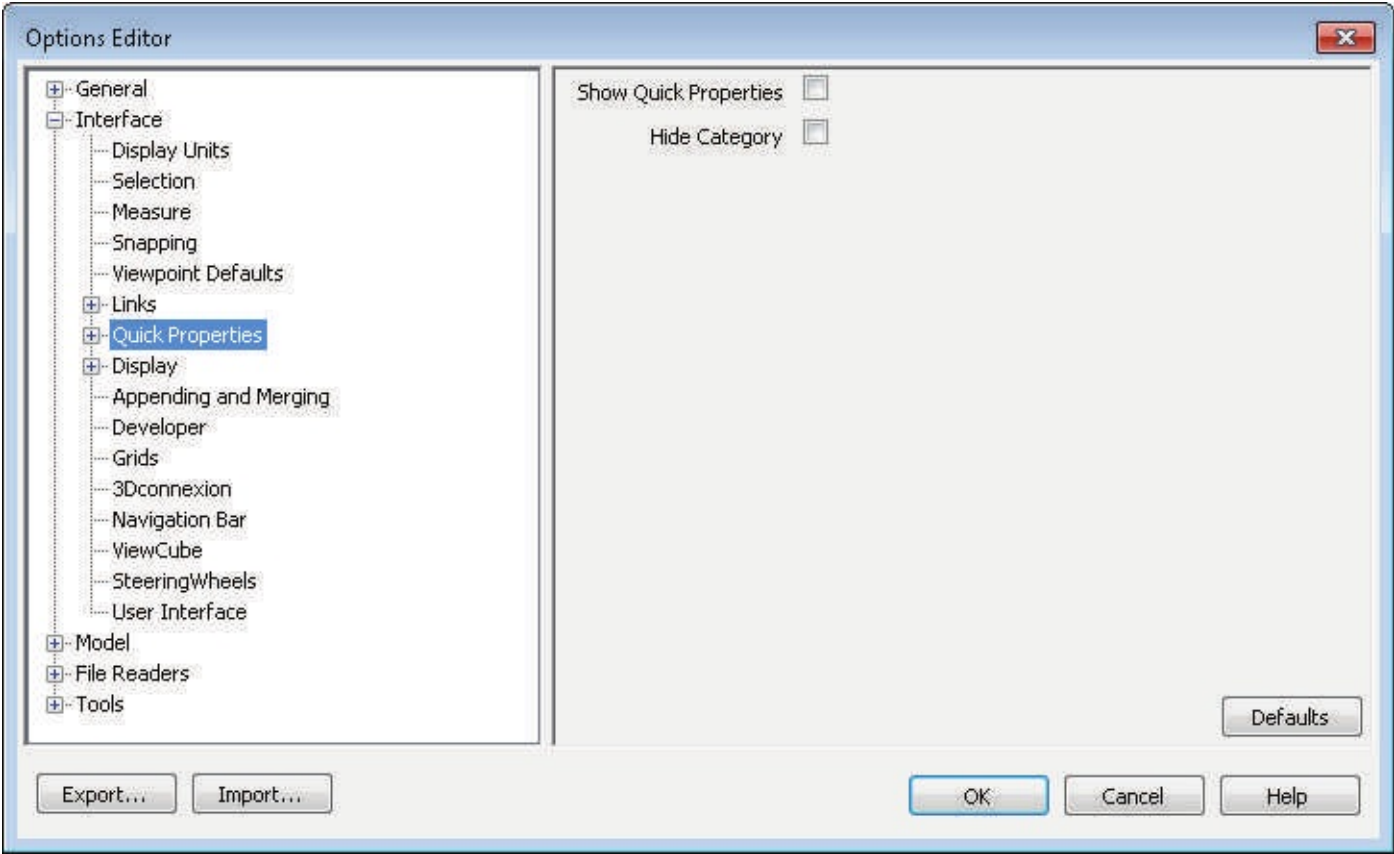
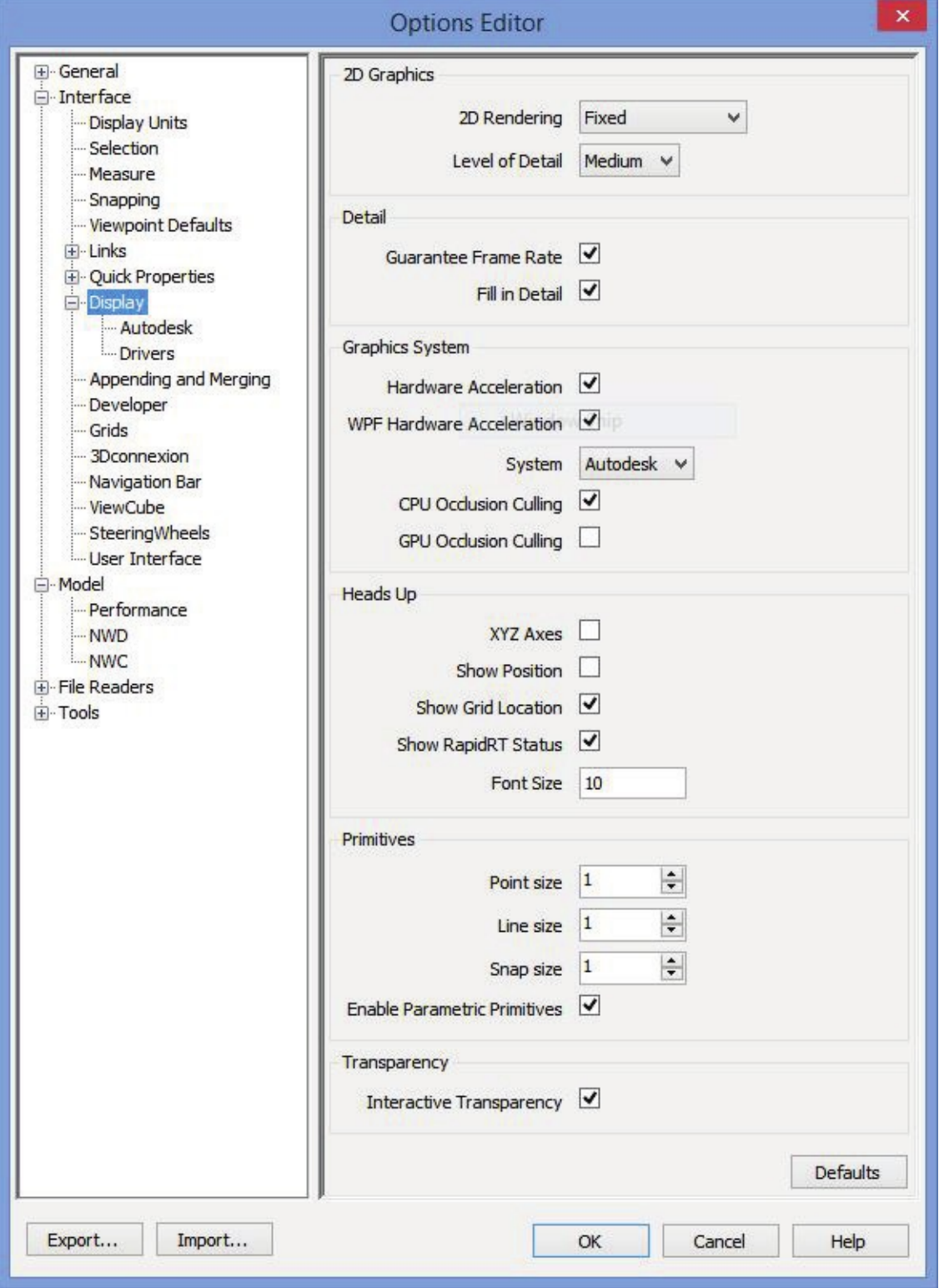


FIGURE 3.12

You can enable Quick Properties if desired Show Quick Properties Use the checkbox to display Quick Properties in the Scene View as you hover over an item. This option is off by default. If selected, item information will be displayed in a “Tool tip” format.

Display—the settings on the Display branch affect the performance of Navisworks (see [Figure 3.13](#)). You can control options for how two-dimensional views are displayed, the overall level of detail in three-dimensional views and how you take advantage of your computer's graphics system. There is an option for Heads Up display which is an on-screen display that provides your location in the project model. Heads up display is not available in the 2D environment. There is an option for Primitives which are points in the project model that can be snapped to (i.e. a surface, line, point, center of a circle, etc.) when measuring and an option for Navisworks to display transparency interactively in the view.

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FIGURE 3.13

The Display Options in Navisworks

Guarantee Frame Rate—Use the checkbox to have Navisworks maintain the Frame Rate indicated in the File Options dialog on the Speed tab. Refer to the [“File Options” topic below](#) for more information on the on speed. This option is selected by default. If this checkbox is deselected the entire model will

always be rendered regardless of the time it takes to do so.

Fill In Detail—Use the checkbox to have Navisworks fill-in any items not rendered when navigation has stopped. In other words, if you cancel interactive navigation, any items that were not displayed will be filled in onscreen. This is on by default and it is recommended that you leave it enabled.

Auto-Select—Use the checkbox to have Navisworks automatically select the graphics system (Basic or Autodesk) used to render your project model. This option is selected by default. Deselect this checkbox if you want to manually select the graphics system manually. Once the checkbox is cleared the System drop-down is enabled.

Hardware Acceleration—Use the checkbox to enable hardware acceleration, if available, through your graphics cards. This option is selected by default. If • Understanding Navisworks •

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you find that Navisworks does not function well as you are trying to navigate or perform tasks trying clearing this checkbox as your first troubleshooting step.

WPF Hardware Acceleration—Use the checkbox to enable any WPF hardware acceleration, if available, through your graphics card. This option is selected by default. If you find that Navisworks does not function well as you are trying to navigate or perform tasks trying clearing this checkbox as your first troubleshooting step.

Note: If your graphics card does not support hardware acceleration, or WPF hardware acceleration, the checkbox will not be enabled.

TIP: OpenGL will allow you take advantage of graphics cards supporting OpenGL, if available.

However, some OpenGL drivers can cause problems. If you experience your project model not fully loading, excessive drop-out, or the Navisworks window freezing or unexpectedly closing down, you should turn off Hardware Acceleration.

System—This drop-down allows you to select one of the following options for material display in Navisworks.

- **Basic**—Supports the display of Presenter materials and uses hardware or software OpenGL.
- **Autodesk**—Supports the display of Autodesk materials and uses Direct3d or hardware OpenGL.

Note: 3D project model can use either graphic system, Basic or Autodesk. However, the Autodesk system is the default except when working with project model that contain Presenter materials. 2D views will only use the Autodesk graphics and requires a graphics card that supports hardware acceleration.

CPU Occlusion Culling—Use this checkbox to enable this type of culling.

Culling only draws visible items and does not draw items behind other items.

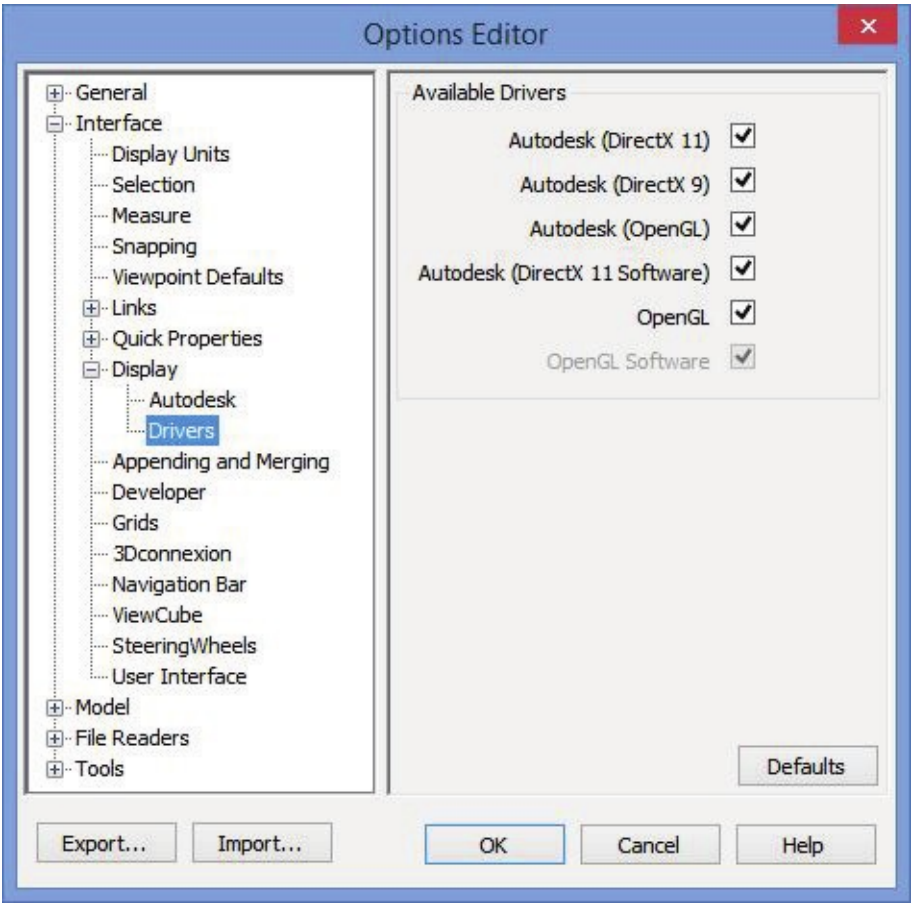
This checkbox is selected by default. This type of culling will use any spare CPU core to perform

occlusion culling tests, only when 2 or more CPU cores exist. Selecting this checkbox will not reduce performance when the entire project model is visible.

GPU Occlusion Culling—Use this checkbox to enable this type of culling.

Culling only draws visible items and does not draw items behind other items.

This checkbox is not selected by default. Selecting this checkbox improves the display performance when the bulk of the project model is not visible (i.e. a walk through, or animation, in a small area of your project model). Occlusion • Section II •



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Culling is not available for 2D views nor will it be available unless the graphics card meets the minimum systems requirements as outlined by Autodesk.

Interactive Transparency—Use this checkbox to render transparent items (i.e. glass, etc.) as you are navigating the Scene View. This checkbox is not selected by default. This means that transparent items will only be rendered once navigation has stopped. If your computer hardware supports this feature, it is recommended that you enable it as you will get more pleasing results in your interactive navigation.

Note: If your graphics card does not support hardware acceleration and this checkbox is enabled display performance can be adversely affected.

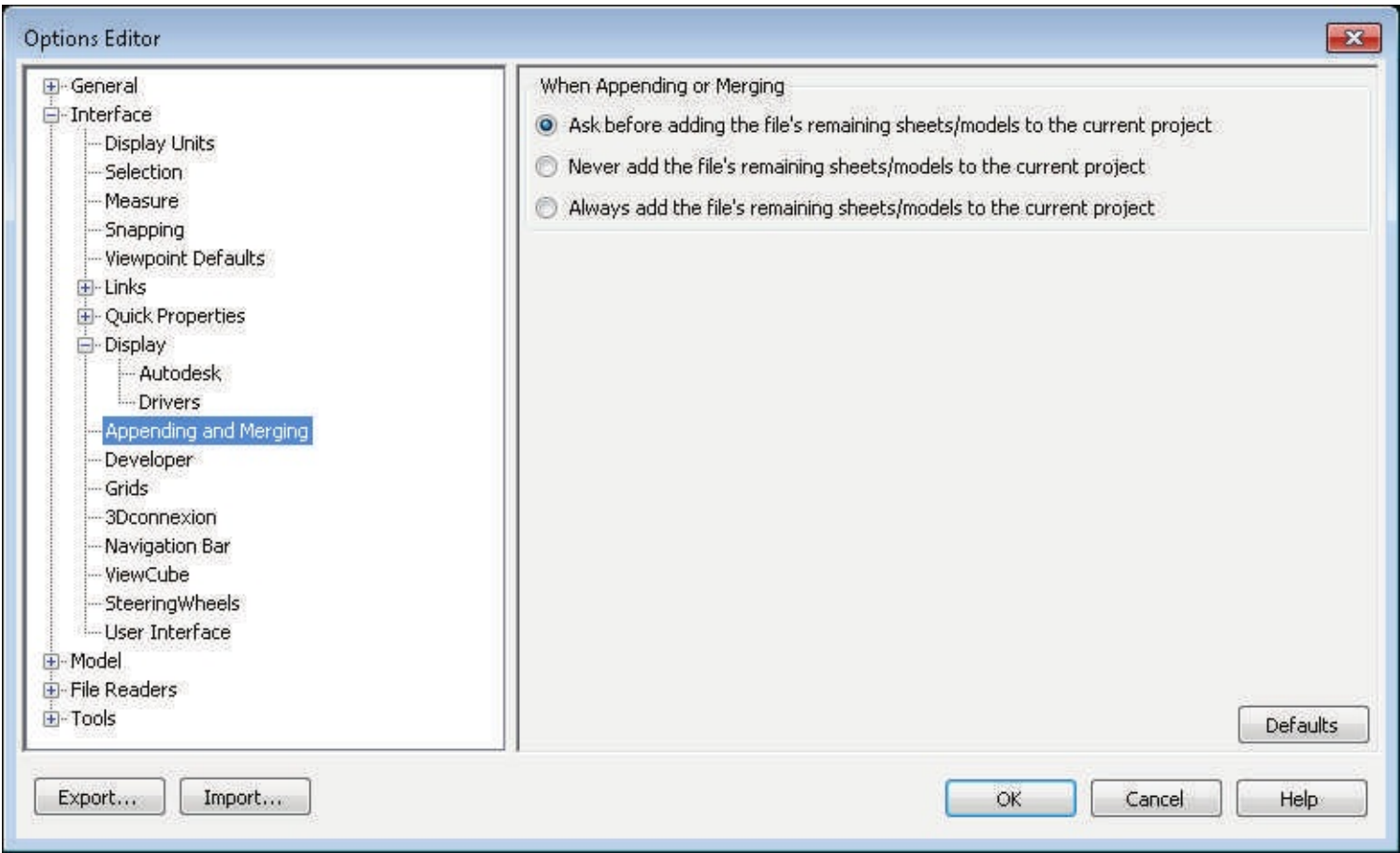
Display > Drivers—Display has two sub-items. To review the list of drivers that Navisworks will support, expand Display and select Drivers. By default al drivers are selected (see [Figure 3.14](#)).

FIGURE 3.14

Graphic Driver options are listed beneath Display Autodesk (DirectX 11)—Supports the Autodesk graphics system, as assigned through the System drop-down, and is available for both 2D views and 3D geometries. If this checkbox is cleared Navisworks will ignore this driver when rendering.

Autodesk (DirectX 9)—Supports the Autodesk graphics system, as assigned through the System drop-down, and is available for both 2D views and 3D geometries. If this checkbox is cleared Navisworks will ignore this driver when rendering.

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Autodesk (OpenGL)—Supports the Autodesk graphics system, as assigned through the System drop-down, and is available for both 2D views and 3D geometries. If this checkbox is cleared Navisworks will ignore this driver when rendering.

Autodesk (DirectX 11 Software)—Supports the Autodesk graphics system, as assigned through the System drop-down, and is available for both 2D views and 3D geometries. If this checkbox is cleared Navisworks will ignore this driver when rendering.

OpenGL—Supports the Basic graphics system, as assigned through the System drop-down, and is only available for 3D geometries. If this checkbox is cleared Navisworks will ignore this driver when rendering.

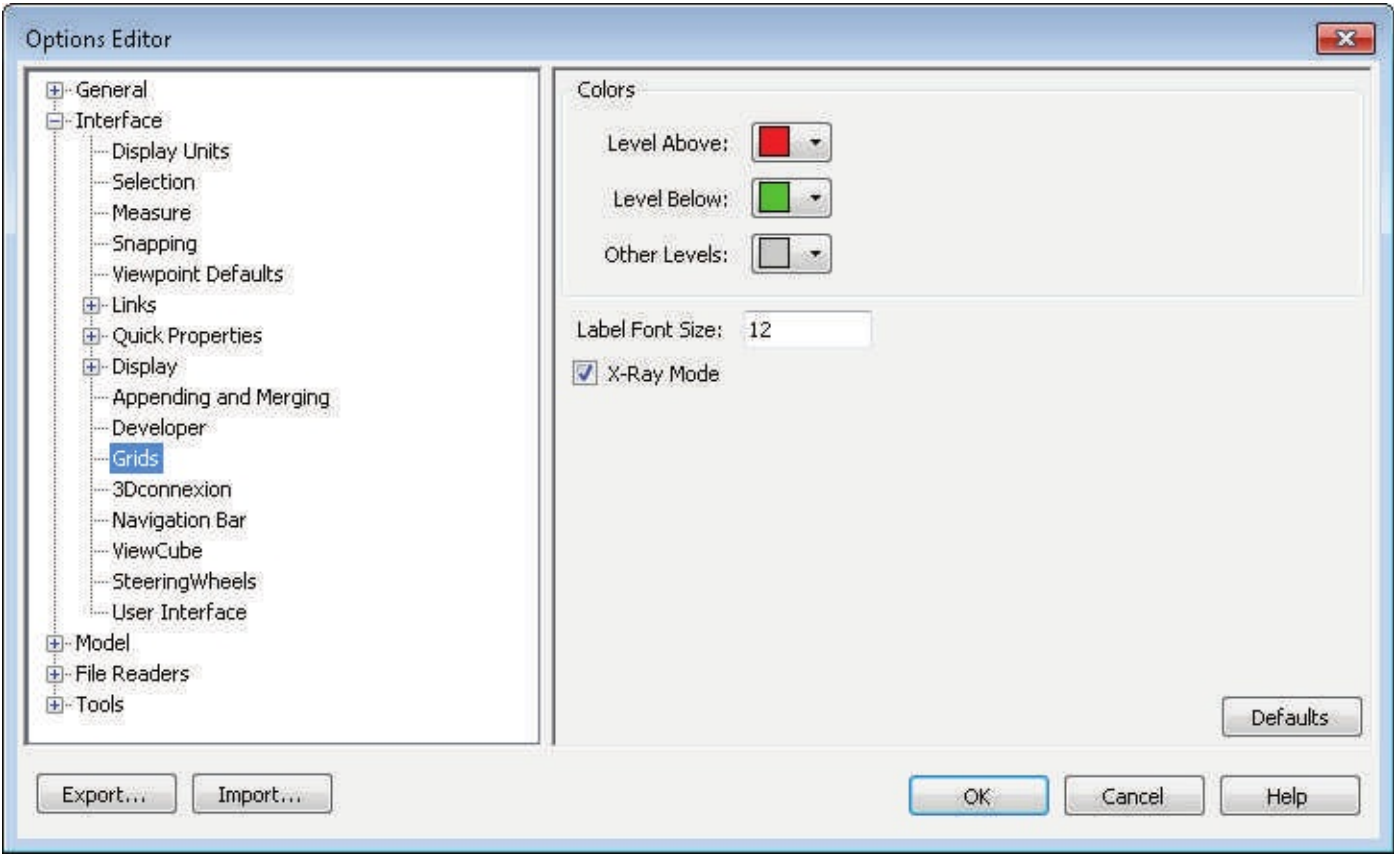
OpenGL Software—Supports the Basic graphics system, as assigned through the System drop-down, and is only available for 3D geometries. This checkbox cannot be cleared as it is the default for the Basic graphics system.

Appending and Merging—There are three options available to control the appending and merging behavior with working with multi-sheets/model files ([see Figure 3.15](#)).

FIGURE 3.15

Appending and Merging options control how appended and merged models and sheets are handled
Ask Before Adding the File’s Remaining Sheets/Models to the Current Project—Use this checkbox to display a dialog once the Navisworks files have been appended or merged. This gives you the ability to choose whether or not the rest of the sheets or models will be added to your file. This radio button is selected by default.

Never Add the File’s Remaining Sheets/Models to the Current Project— Use this checkbox to only append or merge the default sheets/models in the selected file. The Project Browser can be used to add the remaining • Section II •



information on the Project Browser.

Always Add the File's Remaining Sheets/Models to the Current Project— Use this checkbox to automatically add the remaining sheets/models in the file once the file has been appended or merged. Appending and merging will be discussed in a later chapter. The added sheets/models can be viewed in the Project Browser. Refer to the [“Status Bar—Project Browser”](#) topic in [Chapter 2](#) for additional information on the Project Browser.

Grids—options on this branch allow you to customize the color of grid lines and to set how the gridlines are displayed when obscured by other objects ([see Figure 3.16](#)).

FIGURE 3.16

Set your preferences for the colors of your Grids Use the drop-downs next to each option to set the color of the gridlines for the level above and below the camera position. You can also customize grids for other levels (not above or below).

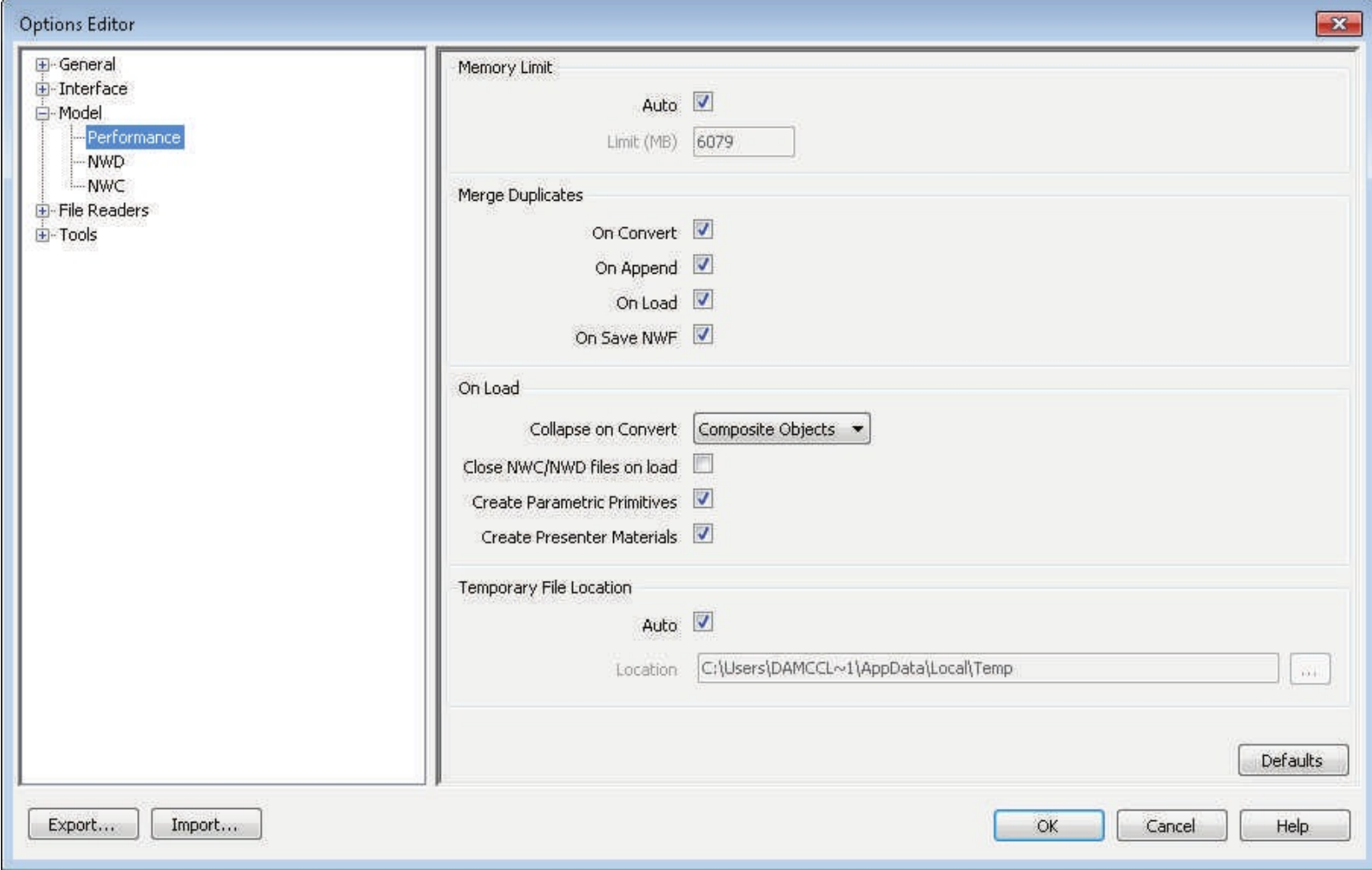
X-Ray Mode—Navisworks will draw gridlines transparently when they are obscured by other objects in the project model. By default this box is selected. Clear the selection if you do not wish to have transparent gridlines.

Gridlines are extremely helpful when reviewing the project and trying to determine your location if room names and numbers are not available.

MODEL SETTINGS

The next major branch of the “Options Editor” dialog is Model. It has no options directly, but rather has three sub-branches each with their own options. To see these, expand the Model branch (see Figure 3.17).

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Let’s start with the Performance options. Selecting Performance exposes several option boxes (see [Figure 3.18](#)).

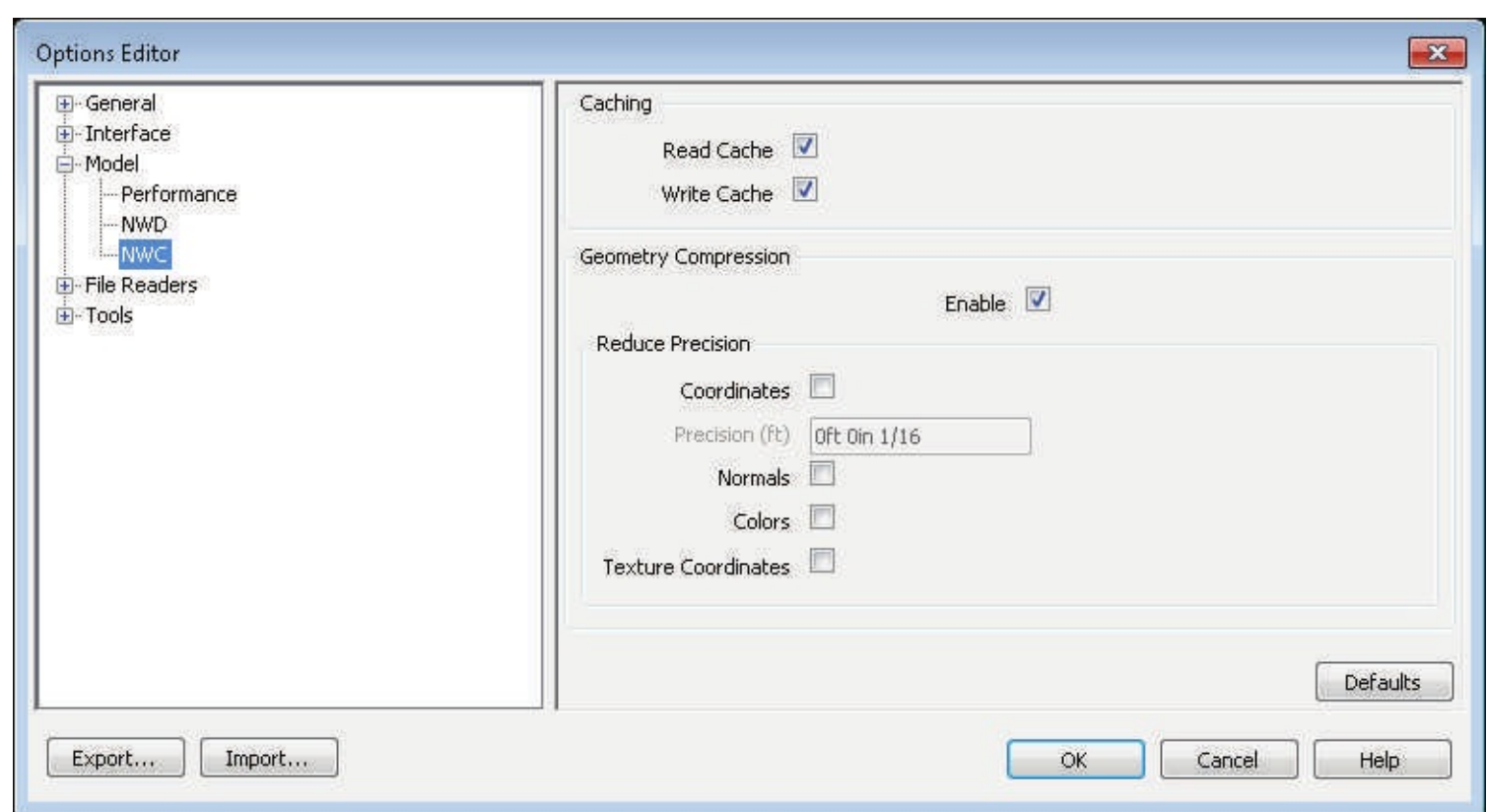
FIGURE 3.17

The Model branch contains settings under three sub-branches Merge Duplicates—All of these options will help improve overall model performance by reducing the total number of similar items that are stored in memory. For example, a model might contain hundreds of windows that are similar in nature (i.e. same, size, shape, data, etc.). In lieu of creating and storing similar data for the same item, Navisworks will create one instance of the data for the similar items and then “share” that data with the other items when that item is selected. All the checkboxes in this category are selected by default. It is recommended that you leave them all selected.

Close NWC/NWD files on Load—When a file is opened in Navisworks, Navisworks will place a file lock on the file so others cannot open the same file. Selecting this option will allow you to open and load the NWC/NWD file into memory and once it is fully loaded into memory Navisworks will close the file by removing the file lock from the file. This will allow others to open the same file that you have opened and edit it while you are viewing the file. This checkbox is deselected by default.

Temporary File Location—Select this checkbox to have Navisworks automatically save your project

files per Windows protocol. By default this checkbox is selected. When the checkbox is deselected you can specify a particular folder for you temporary files. It is recommended that you save your Navisworks temporary files outside of the Windows folder protocol. Remember that the settings in the Options Editor are global settings. If you deselect Auto • Section II •



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and choice a folder location all users will be placing their temporary files in the same folder structure. It might be necessary to involve your IT department to help determine the best location for the Navisworks temporary files.

When Navisworks opens non-native files it wil access or create a cache file for selected file.

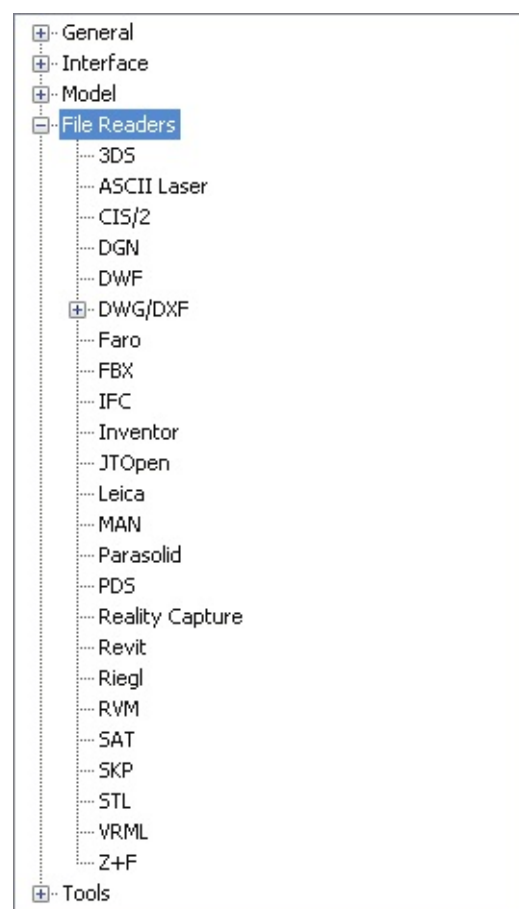
The cache file contains information Navisworks needs to access the file efficiently. If you enable the read and write caching features, load times are quicker as Navisworks does not have to recreate the cache each time. There are some additional precision options on this branch as well. For example, it is possible to reduce precision to speed up cache creation times. However, it is recommended that for the best experience you do not do this.

Experiment to find the best settings if you need to, but if possible use full precision models ([see Figure 3.18](#)).

FIGURE 3.18

The NWC (Navisworks Cache file) options

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FILE READERS SETTINGS

Within the Options Editor dialog, in the tree window expand File Readers ([see Figure 3.20](#)).

FIGURE 3.19

A few of the File Reader Options that you should review before using Navisworks Navisworks gives you the ability to open other product's native files. For example, Navisworks can actually open an AutoCAD DWG or Revit file in their native formats.

Expand the File Readers branch to see the available file readers. Each one has its own settings.

By default some Readers are set to meters while others are set to millimeters. It is recommended that you review the various settings and at a minimum the Default Units and the Default Decimal Units for each of the file readers you intend to use in your work. Make any adjustments necessary to make the import process consistent and predictable.

If you use Revit, be sure to review the Coordinates (Shared or Project Internal) for the Revit File Reader.

TOOLS SETTINGS

The last branch of the “Options Editor” dialog is Tools. This refers to the four main aspects of Navisworks: Clash Detective, Timeliner, Scripter and Animator. In the tree expand the Tools branch to see a sub-branch for each item (see [Figure 3.21](#)). For example, when you perform a clash analysis you can customize the colors used to highlight items in the clash.

Office standards should prevail here to ensure that everyone is visually looking at the items in the same manner.

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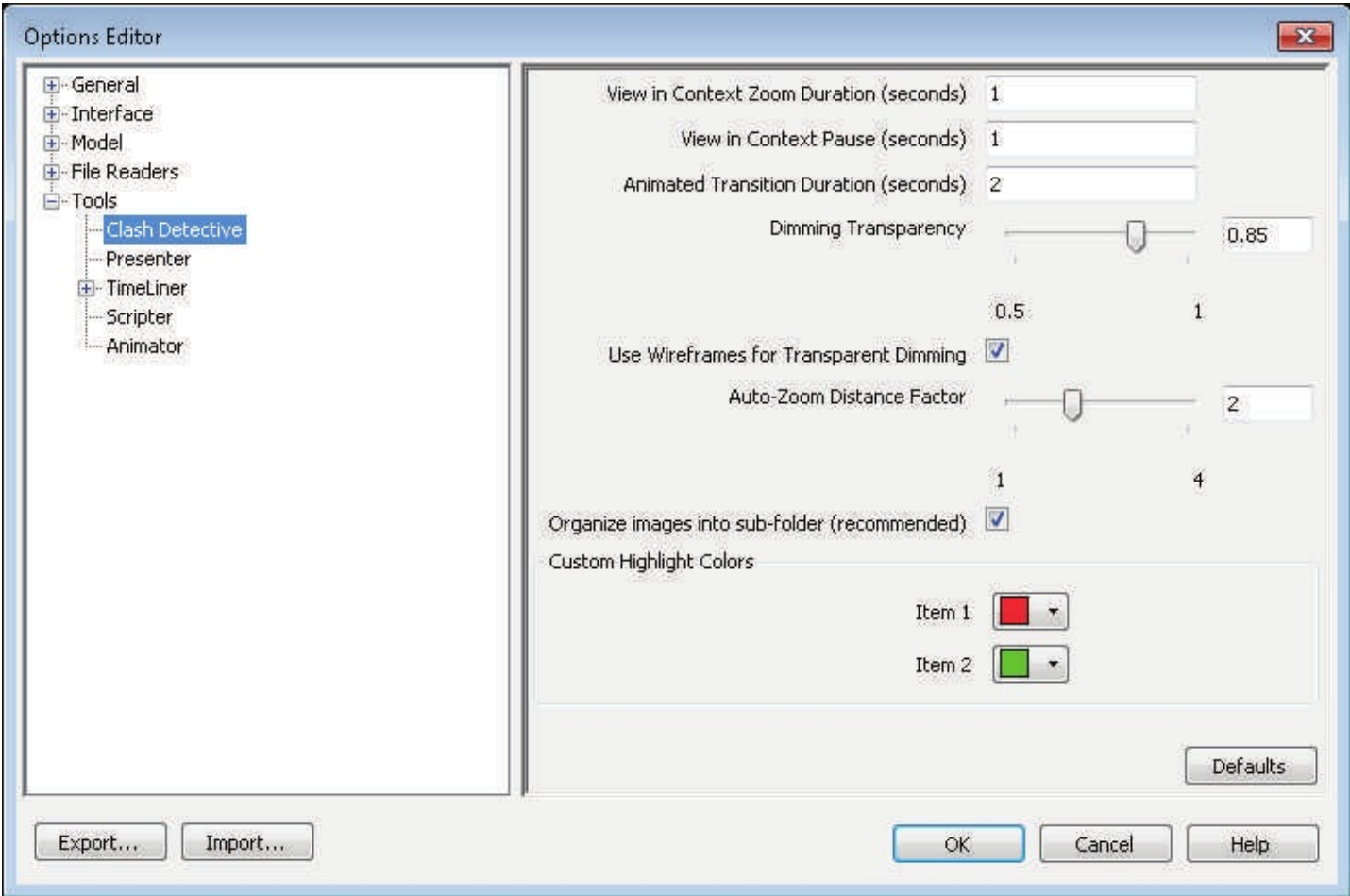
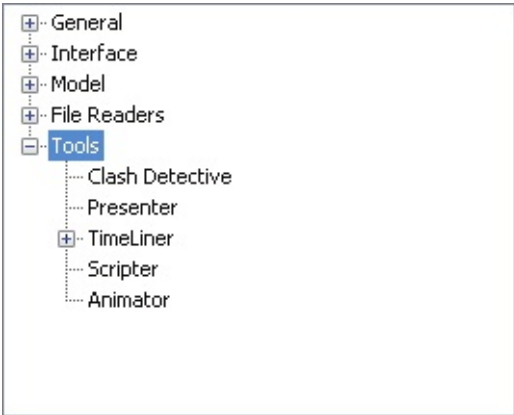


FIGURE 3.20

Each of the main Navisworks components has settings we can configure under Tools. Within the Tools Options, we are going to focus on Clash Detective and TimeLiner.

Selecting Clash Detective exposes several options (see [Figure 3.22](#)). Let’s review Custom Highlight Colors.

FIGURE 3.21

The Clash Detective Options in Navisworks Custom Highlight Colors—Use the drop-downs to set the colors of the items in conflict.

Select Time Liner to set the beginning and end of the work days and to determine if time is to be displayed in the date column in the Tasks tab (see [Figure 3.23](#)).

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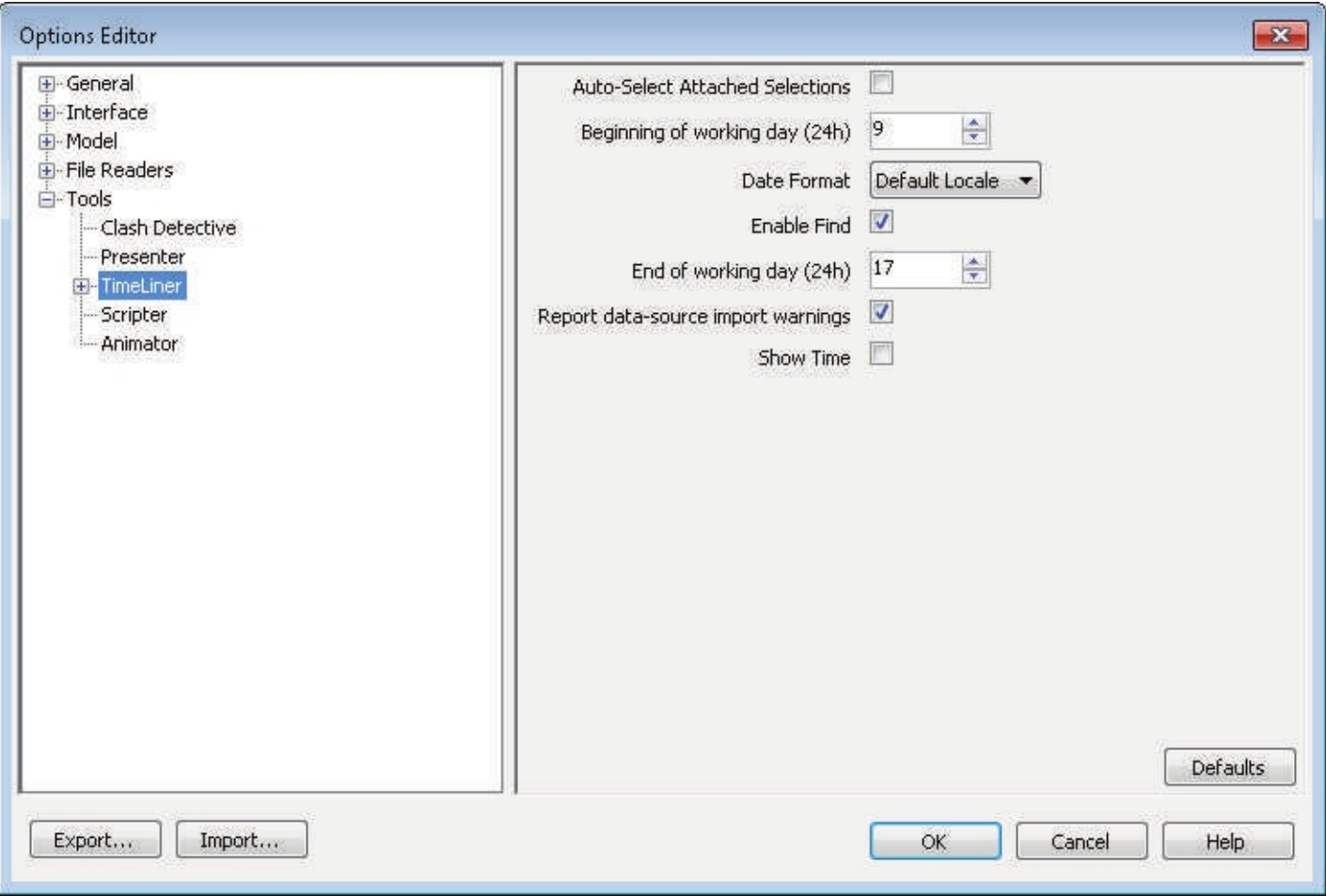


FIGURE 3.22

The Grids Options in Navisworks

Beginning of the working day—Specify the hour of the beginning of the working day. 9 is the default.

End of the working day—Specify the hour of the end of the working day. 17 is the default.

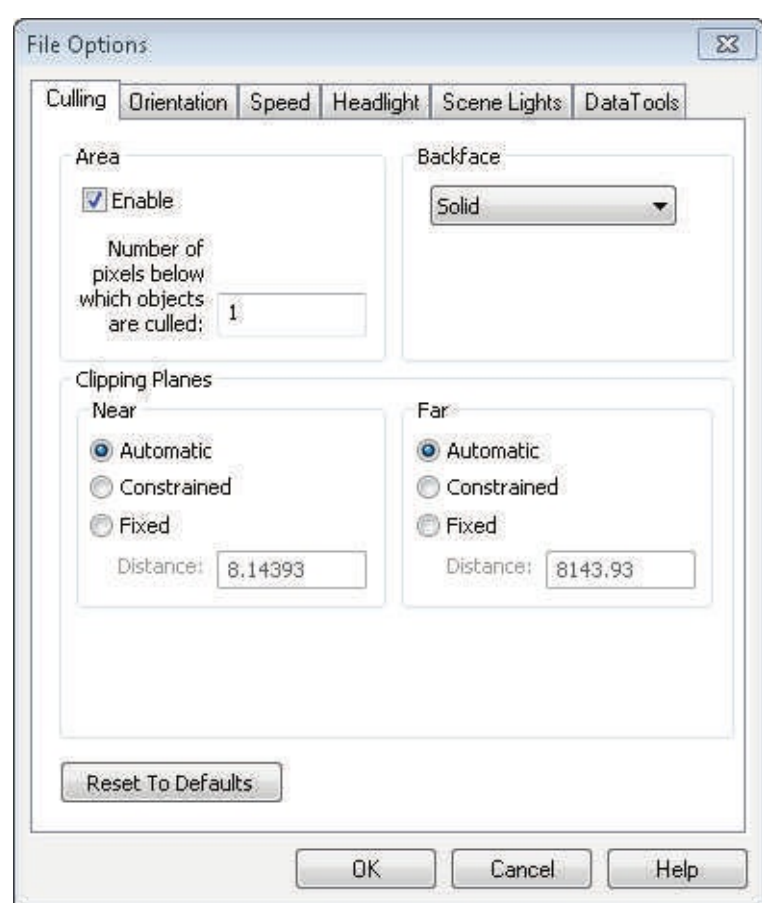
Show Time—Use the checkbox to include time in the date column of the Tasks tab. The checkbox is deselected by default.

If you are unsure what options you need, the default settings in the Options Editor are usually a good place to start. The defaults will offer the best experience for most users. If you made adjustments to any of the settings as you were reviewing this text feel free to click OK

now to close the dialog and preserve those changes. If you prefer not to save your changes, click Cancel instead. You can also leave the settings at the default values for now and then modify them as you are continuing to learn the Navisworks product.

Note: If at any point you wish to reset any of the settings to their defaults in the “Options Editor” dialog you will need to select the branch for the collection of settings that you wish to reset (i.e. Tool > Clash Detective) and then in the Options Editor click the Defaults button. In other words, clicking the Defaults button will not reset all of the Options in the Options Editor. It will only reset the values for the options selected in the tree window of the Options Editor.

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There are many other settings in the “Options Editor” dialog. The goal of the previous descriptions was to get you started in the exploration of settings available to you. There will be other settings explored and

modified in the topics and chapters that follow. You are free to explore more on your own now, or wait till a particular setting is discussed in the coming lessons.

FILE OPTIONS

Up to this point we have discussed global settings in Navisworks that affect all users of the product on a particular machine. Now let's review a few options that will only impact your current project file. Those options are stored with the project file and not stored in the Navisworks product. Anyone who opens that project file will have those settings, but other project files will not be affected by changes in these settings.

For the discussion below, from the Home tab, on the Project panel, click File Options to open the File Options dialog.

CULLING

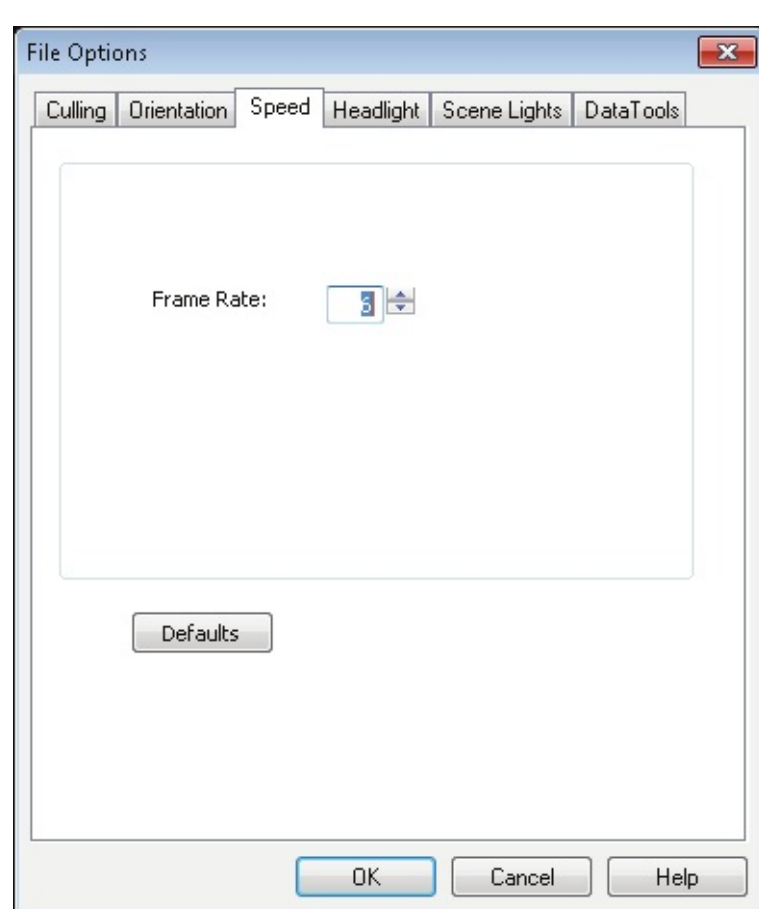
Within the File Options dialog click the Culling tab ([see Figure 3.26](#)).

FIGURE 3.23

Adjust the Frame Rate of the project model through File Options Culling helps you navigate large and complex View Scenes by hiding less important items.

There are three ways of culling items.

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Area—An item’s size, in pixels, will determine if the item is rendered. By default, items smaller than one square pixel are not rendered.

Backface—Only the front face of an item is rendered. By default the Backface of the item is set to Solid.

Note: On occasion Navisworks will switch the front face and the back face of an item(s) during the conversion process. If you notice that this happened in your project model you will need to change your Backface option.

Clipping Plane (Near and Far)—Items closer to the camera than the near clipping plane and beyond the far clipping plane will not be rendered. By default, Navisworks automatically constrains both the near and far clipping planes but they can be constrained or adjusted manually if need be.

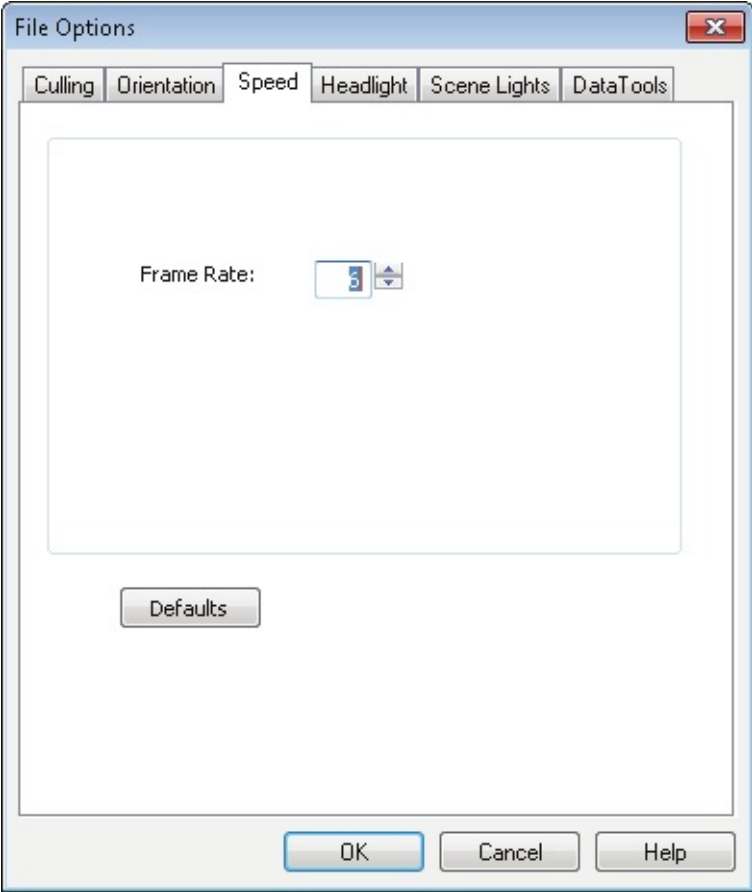
Note: Backface and Clipping Planes are not used in a 2D view.

ORIENTATION

Within the File Options dialog click the Orientation tab (see [Figure 3.26](#)).

FIGURE 3.24

Adjust the Orientation (North and Up) of the project model through File Options Navisworks uses a traditional X, Y, Z coordinate system. This means that an axis can point in any direction and the corresponding axes will be “along for the ride”. For the most part Navisworks will read project model data to determine which way is North and which way is Up. North and Up are two different directions in Navisworks. If Navisworks cannot • Section II •



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determine this information from the project model than by default the Z axes will be treated as Up and the Y axes will be treated as North. Orientation allows you to change the North and Up directions of the entire model. This is referred to as World Orientation. Navisworks also allows you to change the Up direction of your current Viewpoint. This is referred to as the Viewpoint Up vector.

Note: Changing the Viewpoint Up will affect navigation modes that depend on the Up direction of the Viewpoint. This will include Walk and Orbit. This also impacts Section Views as well.

SPEED

Within the File Options dialog click the Speed tab ([see Figure 3.26](#)).

FIGURE 3.25

Adjust the Frame Rate of the project model through File Options Model sizes within Navisworks will vary. As you begin to move around in the Scene View Navisworks decides which items to render first and items that Navisworks does not render are dropped out. However, the items that are dropped out will be rendered once navigation stops.

The amount of drop-out depends on several factors. Those factors can include hardware performance (graphics card and driver), the size of the Scene View, and the size of the Navisworks project model. When working with project models you might require additional • Understanding Navisworks •

RAM to load the model and navigate through it. Refer to Autodesk’s website to determine the minimum System Requirements for the Navisworks products.

Tip: Reducing the speed drop out value reduces drop-out, but can cause jerky movement during navigation. Increasing the value ensures a smoother navigation, but increases drop-out.

This tab allows you to specify the number of frames per second that are rendered in the Scene View. The default value is 6 and the values can be adjusted from 1 to 60 frames per second. Adjust the frame rate speed to reduce the amount of drop-out during navigation in the Scene View. A reduction in value will reduce drop-out but navigation will become “jerky”. An increase in value provides smoother navigation but drop-out increases.

Note: If you do not see an improvement in navigation after adjusting the Frame Rate you should consider turning off the Guarantee Frame Rate option in your global settings.

Refer to the Options Editor Interface Settings topic discussion above.

The default settings in the File Options are always a good place to start and most times offer the best experience for most users. If you made adjustments to the settings as you were reviewing this text feel free to click OK to close the dialog. Remember these settings will be stored with your Navisworks project file only. You can leave the settings at the default values if you would like and modify your settings as you are working in various different project files.

At any point if you wish to reset any of the settings in the File Options dialog you will need to select the tab that you wish to reset (i.e. Speed) and then click Defaults.

Note: Clicking Defaults will not reset all the File Options it will only reset the values for the tab selected in the File Options dialog.

You should now have a decent understanding of the kinds of settings that we can configure in Navisworks. In the chapters that follow, we will revisit some of these values as the various lessons require.

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SUMMARY

We have discussed global and file settings that impact the Navisworks product or your project file(s). Armed with this information you are now ready to begin exploring Navisworks further in the chapters that follow.

Global settings persist from Navisworks session to Navisworks session regardless of the user or the project file that is opened.

File settings only apply to project files and are not maintained on a global scale.

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Chapter 4

Files and File Management

INTRODUCTION

In this chapter we will explore the different types of Navisworks files and the options available to you when opening those files. Navisworks also has the ability to read and open many other file types that are not the native Navisworks file format. When opening files from other products, Navisworks will automatically create a native Navisworks file from the file being opened. That file is typically smaller in size and optimized to open much faster in Navisworks. There are several different options when opening your Navisworks project file(s).

OBJECTIVES

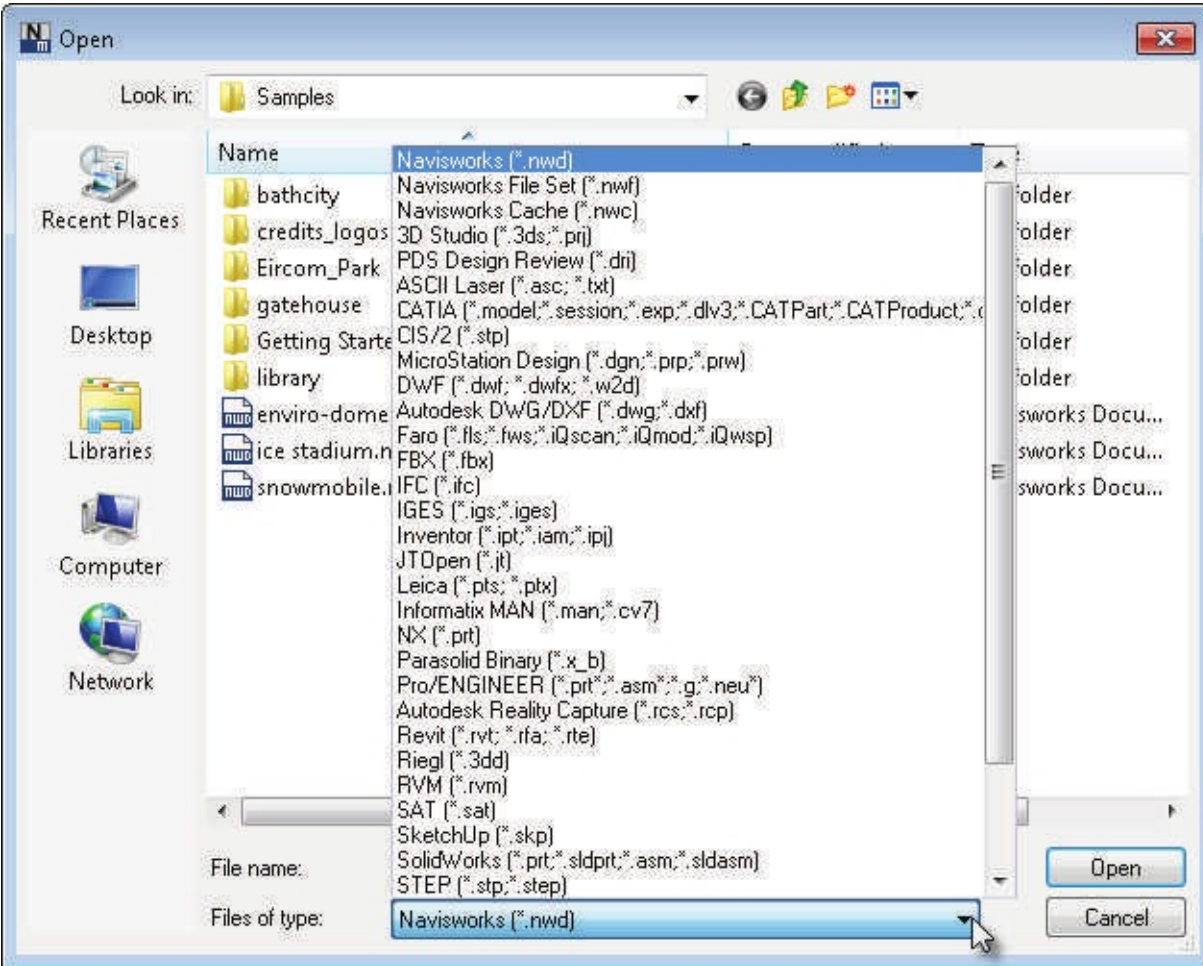
The overall goal of this chapter is to help you understand the native Navisworks file formats, their behavior, and how you can open non-native files in Navisworks. Topics we will explore include:

- An overview of a NWD, NWC, and NWF file format.
- Files that Navisworks can read natively.
- Open, Append, and Merge files.
- Align files that are not in sync with one another.

NAVISWORKS FILES

There are three types of Navisworks files: the NWD (a Navisworks Document file), the NWC (a Navisworks Cache file), and the NWF (a Navisworks File Set). Each file serves a different purpose from the others.

NWD Files—an NWD file should be considered a picture in time of your Navisworks project model. This file will contain all the geometry and data but the file cannot be updated like a NWC or NWF file can. In other words, this file is static and not dynamic. The



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purpose of this file is to share information with others who will be reviewing the model and providing feedback to the project team. Think of a NWD file as akin to a hard copy plot that you will give to a member of the project team to mark-up and return to you for input. As they mark-up the plot, review and comment in the NWD file, you can continue to work in the project model and update the Navisworks files. Once you receive their feedback you can incorporate their feedback into the dynamic Navisworks project model. However, this process will not be automatic.

Note: Navisworks Freedom, a free viewer from Autodesk, can only open only NWD files. It cannot open NWC or NWF files or other non-native Navisworks file formats.

NWC Files—Navisworks has the ability to open several different types of files that are not native Navisworks files. To review the most current list of non-native files that Navisworks can open, familiarize yourself with the Files of Type: drop-down in the Open dialog to view the list of files (see [Figure 4.2](#)).

FIGURE 4.1

Non-native Navisworks files that Navisworks can read directly into the Navisworks program Note: As the Navisworks program continues to evolve with each new release, Autodesk might include new File Readers in the product. So be sure to check the list on a regular basis.

When you open a non-native Navisworks file (any file other than an NWD, NWC or NWF

file), Navisworks will automatically create an NWC file for you in the same folder with the same name as the non-native file. The NWC file will contain all the geometry and data from the original non-native Navisworks file. NWC files are typically smaller than the non-native Navisworks file(s) and are optimized for use in Navisworks allowing them to open much faster. If you attempt to open the same non-native Navisworks file after Navisworks has created the NWC file, Navisworks will look at the corresponding NWC file and compare it to the non-native file that you are opening. If the NWC file is newer than the non-native Navisworks file Navisworks will not convert the non-native Navisworks file again; instead it will simply open the newer NWC file. If the non-native Navisworks file is newer than the NWC file then Navisworks will automatically create a new NWC instead (replacing the existing NWC) and open that file.

In the previous chapter we discussed global settings that impact all Navisworks users. One of the settings we briefly discussed was the NWC caching setting found in the Options Editor dialog under Model. If you did not review those settings please take time to do so now.

NWF files—a NWF file is a file that does not contain any geometry or data. This file merely contains points or references to other files that might have been combined together to form your Navisworks project file. Think of it like a set of instructions on how to assemble a group of files and where each should be placed relative to one another in context.

TIP: NWF files should always be used when you have multiple files that are combined to form the overall Navisworks project.

OPEN, APPEND AND MERGE NAVISWORKS FILES

There are several ways that you can open files for use in Navisworks. From the Application menu, on the Open submenu, you will find Open, Append and Merge. The Open tool can also be found on the QAT with a drop-down for Append and Merge. Finally, Append and Merge are also located on a drop-down button on the Home tab.

TIP: Hold the CTRL key while selecting files to add to the current selection. Hold the SHIFT key while selecting a sequential group of files.

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There are other ways to open Navisworks files as well. Once the Navisworks program is open and the Selection Tree is available you can drag and drop a Navisworks file into the Selection Tree to open the file. If the Navisworks program is not open yet you can drag and drop a Navisworks file on to the Navisworks icon in your Desktop to open the file. Navisworks will also keep a list of recently opened files in the Recent Documents list found in the Application Menu. The total number of files stored in this

list is controlled through the Options Editor as discussed in the previous chapter.

Note: If a non-native Navisworks file is chosen Navisworks will automatically use the appropriate File Reader to open the file.

You can also open a Navisworks file via a URL link. Do this on the Application Menu from the Open submenu. In the “Open URL” dialog that appears input the web address where the file is located along with the file name you wish to open. This functionality allows you to access your Navisworks files from a web server. Once your Navisworks files have been published to the web server others can access the file(s) remotely.

OPEN A REMOTE FILE

Let’s review how to access a file remotely. (You will need an internet connection to perform the following steps).

1. From the Application Menu, highlight the Open fly-out, (it will expand on the right) and then choose: Open URL.
2. In the “Open URL” dialog type:

<http://download.autodesk.com/us/navisworks/brewery.nwd>

As you load the file, recall the discussion of the performance indicators in [Chapter 2](#). In the [“Status Bar—Performance Indicators”](#) topic, we discussed the Performance Indicators: the Pencil Progress Bar, the Disk Progress Bar, the Web Server Progress Bar and the Memory Bar. If you did not review this topic, please take the time to do so now. As this file is loading, observe the behavior of all the Performance Indicators.

3. Click OK.

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Once the file is open feel free to navigate around the model. You can simply drag with the left mouse button depressed to orbit around the model, roll the wheel on your mouse to zoom in and out and access many more options using the ViewCube or Navigation Bar.

Details on each of the basic Navigation tools were discussed in the [“Scene View Navigation”](#) topic in [Chapter 2](#). Feel free to review them again now.

Navisworks does not have a close file command. In order to close a Navisworks file you will need to open another file, use the New command to create an empty scene or you can exit the Navisworks product from the Application Menu.

4. When you are finished exploring the model, on the QAT (or from the Application Menu) choose the New command.

Regardless how you close your Navisworks file you will always be prompted to save your file if changes were made. In this case if you made any changes, do not save this file.

APPENDING AND MERGING FILES

Once a file is open, you can append other files to it. However, when appending (or merging) files to an already open file, the file that you will be appending or merging must be the same type of file of that which is already open. This means that you cannot append or merge a 2D

sheet set with a 3D model. You will only be able to append or merge 2D sheet sets together or 3D models together.

Note: Duplicate geometry is automatically removed when merging files. Duplicate geometry is not removed when appending.

In the previous chapter we discussed global settings that are applied to the Navisworks product. Some of those settings control the appending and merging of files. Please refer to the Options Editor Interface Settings topic in the Navisworks Global Settings and File Options chapter for additional information regarding appending and merging settings.

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TIP: In today's world of data exchange, you could easily receive a NWF file from your project partner(s). If you recall, NWF files only contain points to other files and their locations.

This could cause problems for you when you open the NWF from others especially if the UNC (Universal Naming Convention) is not the same. The best way to overcome this issue is to simply save the NWF file to the same file folder that all the appended or merged files have been placed. The NWF file will then look for the referenced files relative to its own location.

When appending or merging files, it might be possible that the files are not be in sync with each other. This means that parts of your project model might not line-up with other parts.

The easiest way to resolve this issue within Navisworks is to use Units and Transform. Let's look at a simple example. First we will create a project and use the Append tool. Then we will review how we can quickly align project models to be in sync with one another.

OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for instructions.

1. Launch Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

3. In the “Open” dialog, browse to the location where you installed the dataset files.

4. In the *Chapter04* folder select the *04 Architectural.nwc* file and then click Open.

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TIP: If the folder appears empty, at the bottom of the “Open” dialog, from the Files of type drop-down, choose: Navisworks Cache (*.nwc).

5. Move your cursor over the ViewCube.

When it highlights, a small house icon will appear above and to the left of the ViewCube.

This is the home icon and resets the view to a previously saved “home” view.

6. Above the ViewCube, click the Home icon.

You should now be zoomed in and looking at the front of the building. Now let’s append the mechanical work to this project file.

7. On the Home tab, on the Project panel, click the Append tool.

8. In the “Append” dialog, from the *Chapter04* folder select the *04 Mechanical.nwc* file and then click Open.

9. Above the ViewCube, click the Home icon again.

You should now be zoomed out away from the front of the building looking at a building with its mechanical components sitting outside. Now, let’s align the models using the “Units and Transform” dialog.

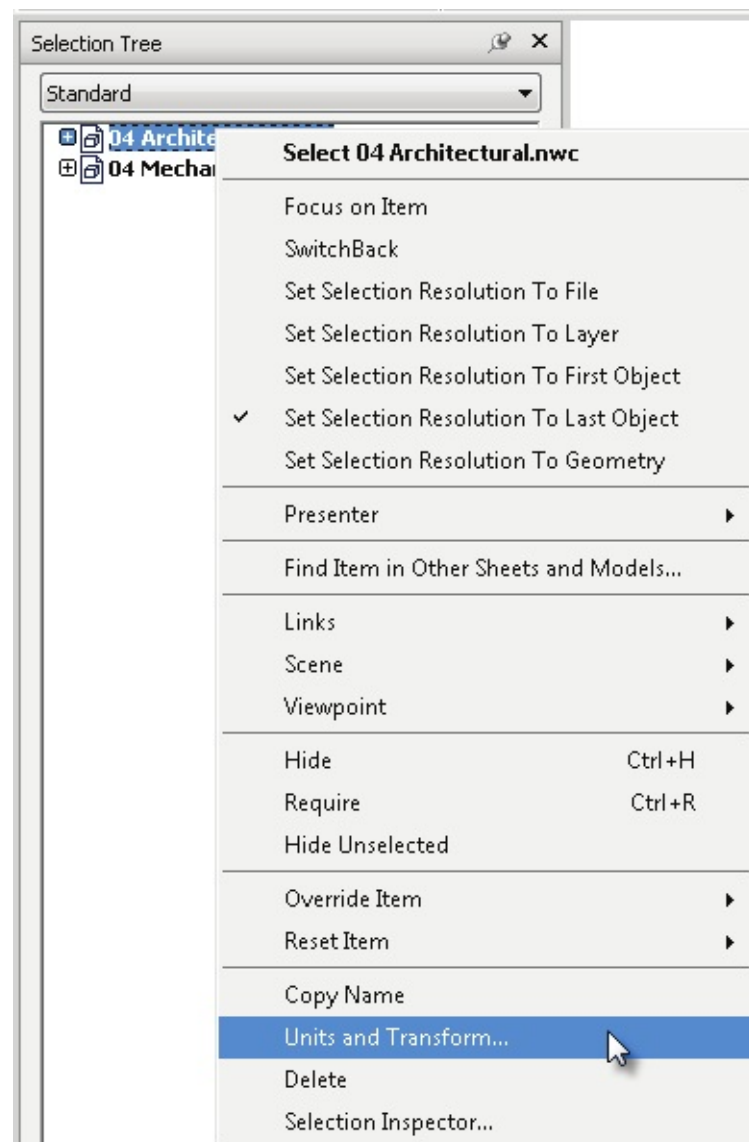
10. On the Home tab, on the Select & Search panel, click the Selection Tree to open the Selection Tree window.

If your Selection Tree was already docked, simply click it to open it. Clicking the tool on the Home tab would actually close it if it is already open.

You can dock the Selection Tree window if you would like. Refer to the [“Dockable Windows and the Docking Tool”](#) topic in [Chapter 2](#) for more information.

11. In the Selection Tree select *04 Architectural*, right-click and choose Units and Transform (see [Figure 4.3](#)).

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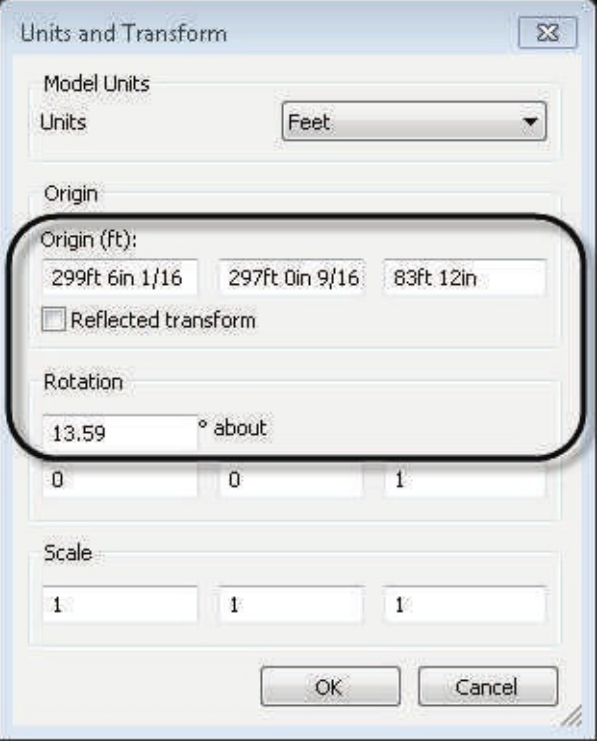


FIGURE 4.2

Access the Units and Transform command from the Selection Tree In this lesson, we will treat the architectural file as the reference file to which we will align the other project model.

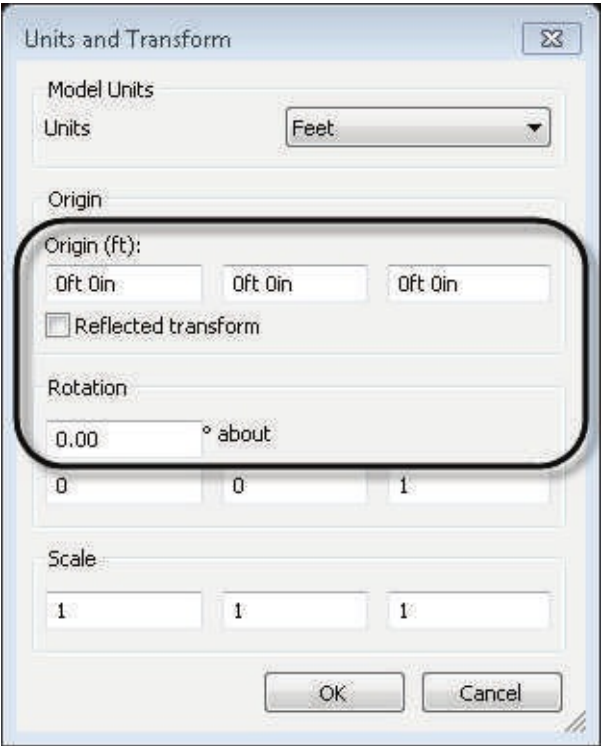
12. Note and write down on a piece of paper the Origin and Rotation data of the architectural model in the “Units and Transform” dialog (see [Figure 4.4](#)).

FIGURE 4.3

Data in the Units and Transform dialog can help you align your models together 13. Click Cancel.

14. In the Selection Tree right-click on the *04 Mechanical* file and then choose: Units and Transform.

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Note that the data in the Origin and Rotation boxes in the Unit and Transform dialog for the mechanical model is different than the architectural model ([see Figure 4.5](#)).

FIGURE 4.4

Use data from the reference model to align other project models 15. Take the information that you just wrote down from the Origin and Rotation boxes of the architectural model and apply that same data to the Origin and Rotation boxes in the Units and Transform dialog of the mechanical file.

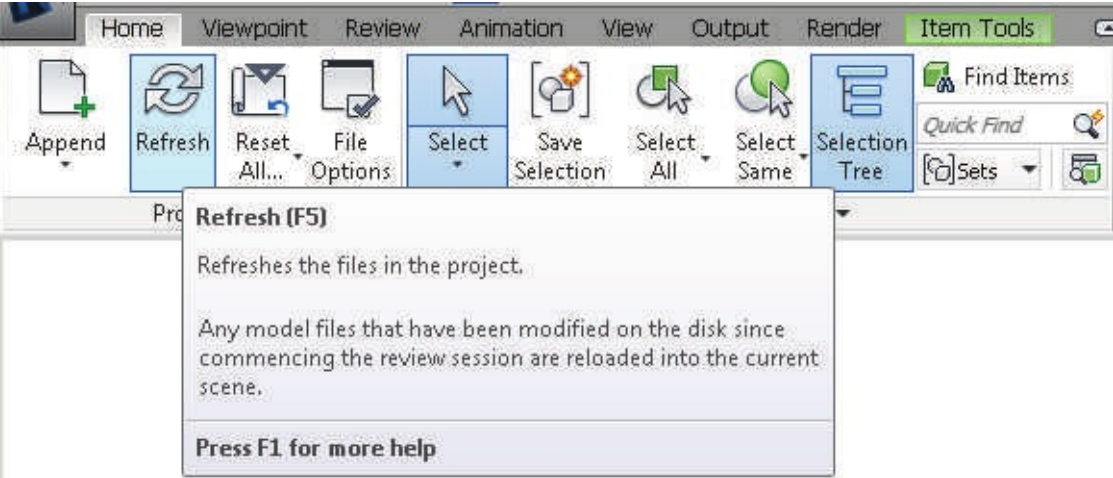
- 16. Click OK.
- 17. Above the ViewCube click the Home icon once more.

Your models are now aligned. You can continue review the model if you would like. When you are finished reviewing the model we will need to close the project file. Remember that we close by loading something in its place.

- 18. On the QAT, click the New icon.

You will be prompted to save the file. Notice that the current file is unnamed. If you choose to save, you will need to give it a new name. This will be an NWF file.

- 19. When prompted to save your file click Yes and then input a name for the file. If you prefer not to save, simply click No.



REFRESHING FILES

While you are working in Navisworks, it is entirely possible that the design team might be working on files that you are currently referenced in your Navisworks project model. To help ensure your data is current, or to refresh your data at any point in time, you can use the Refresh tool to update your Navisworks project files (see [Figure 4.6](#)).

FIGURE 4.5

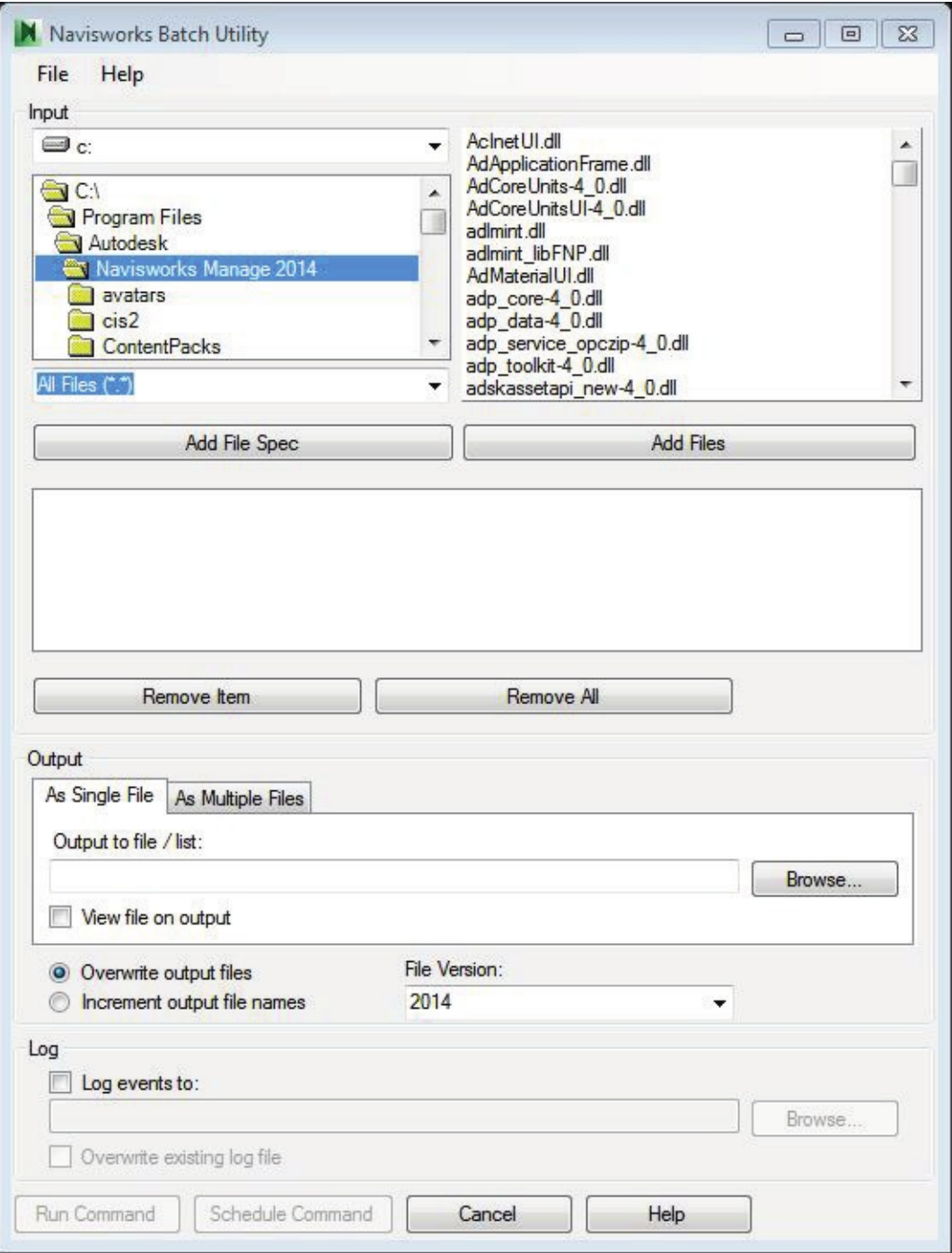
Refresh your Navisworks project files that others are editing while you are viewing the Navisworks project model This tool will reopen, or “refresh” any project files that have been modified since you initially opened those files in your Navisworks session.

BATCH UTILITY

The Batch Utility tool has several uses. One use for it is to append multiple Navisworks files into a single Navisworks file or schedule the appending of multiple Navisworks files into a single Navisworks file. With the Batch utility tool you can also convert multiple project files; either non-native or native Navisworks files, into NWD or NWC files as well. Finally, you can also use the Batch Utility to create a list of all the project files contained in the Navisworks file that you currently have open.

Note: Any currently supported file format can be used when appending or merging files with the Batch Utility tool. However, if NWD files are used they must have been created with the “May Be Resaved” option selected if the Publish tool was used to create them. If they were not created with this option selected, when the Batch Utility tool is run, the NWD cannot be saved.

Let’s explore how we can use the Batch Utility tool to create Navisworks files from files that are not in a native Navisworks format.



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- 1. On the Home tab, on the Tools panel, click Batch Utility.

The “Navisworks Batch Utility” dialog can be broken down to three distinct parts. The upper part is Input, the middle is Output, and the lower is Log (see [Figure 4.7](#)).

FIGURE 4.6

Batch Utility allows you to perform automated tasks in the input part, you can use the drop down to navigate to the drive storing the files that you want to include in the Batch utility. Once you have selected

the appropriate drive you can then navigate to the folder structure containing your files. In this case, it should default to the *Chapter04* folder. If it did not, you can navigate there now.

2. If not already there, navigate to the *Chapter04* folder and double-click on it.
3. Below the folder tree, verify that file type drop-down is set to: All Files (*.*)

Three non-native Navisworks files (Revit) that reside in the *Chapter04* folder now appear in the right window (see [Figure 4.8](#)).

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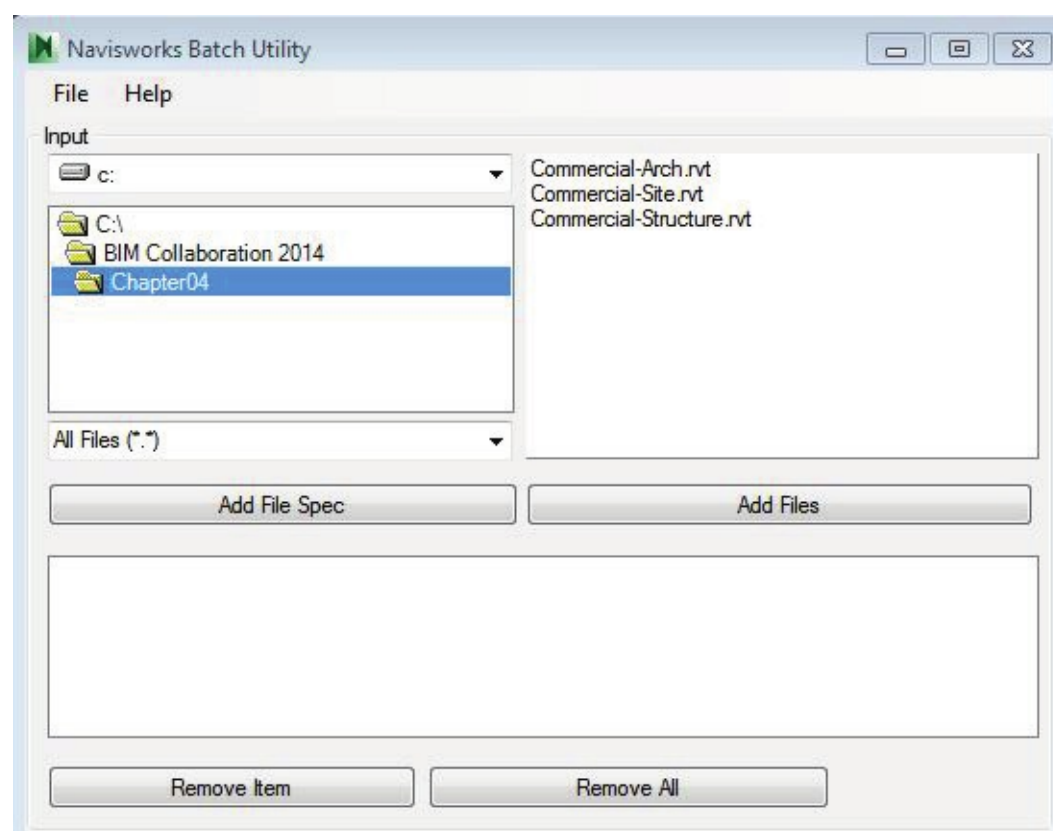


FIGURE 4.7

*Display the files to be included in the Batch Utility 4. Select the *Commercial-Arch.rvt* file and then click the Add Files button.*

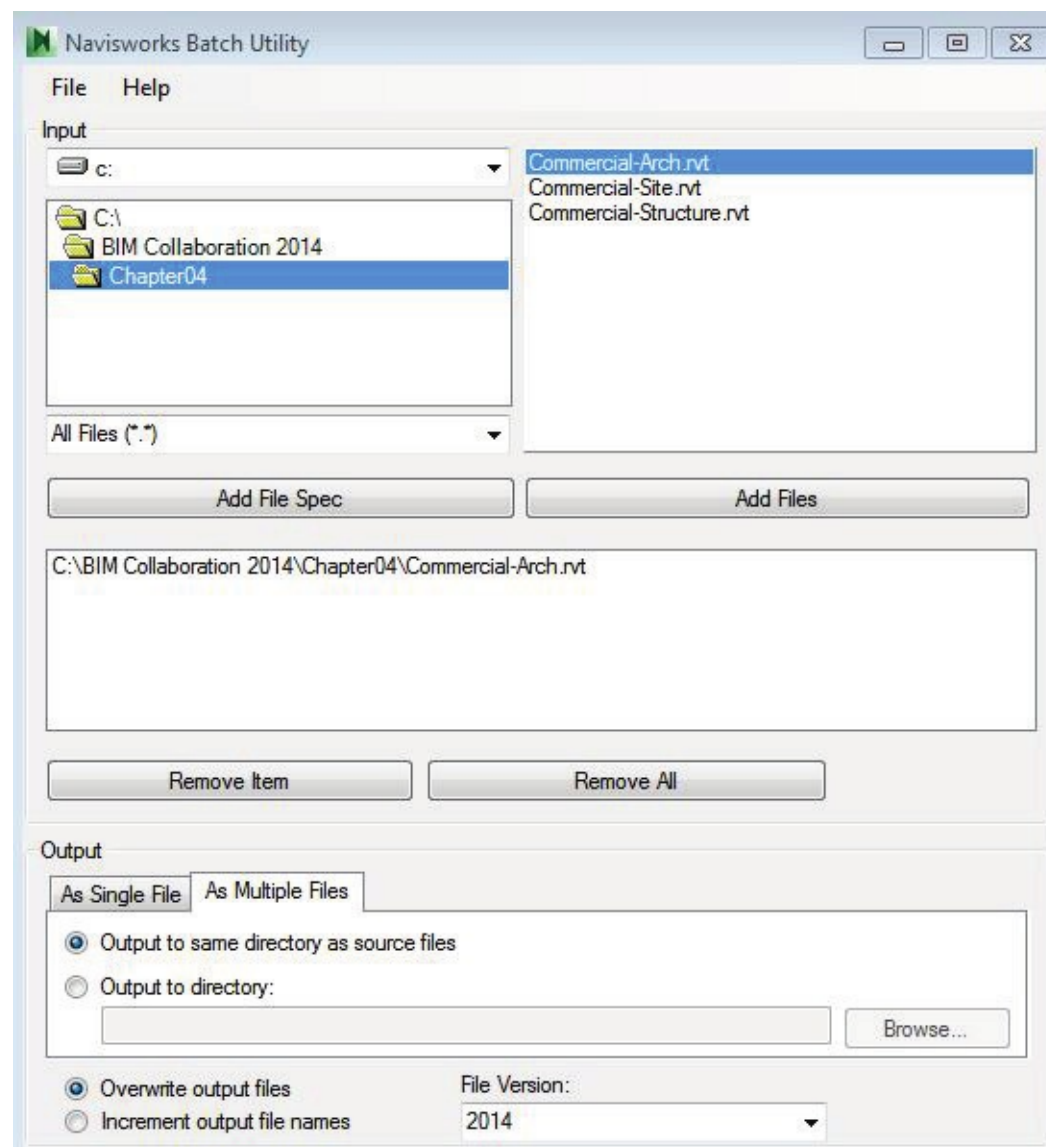
You have now selected a file to be included in the Batch Utility process. You could have selected multiple files but for the purposes of this exercise we will only select one file. We will leave it up to the reader to explore converting multiple files to a Navisworks file format on their own. Although you have selected your file you are not finished yet. Let's review the Output area next.

The output section gives you the opportunity to tell Navisworks what you would like to do with the files you have selected. This section gives you the ability to choose single or multiple file output. For example, you can select a single NWD, NWC or NWF file to combine the files you selected into a single file.

Within the As Single File tab you can select the file that you wish to combine your files into or you can select a file that you wish to list all the project files contained in the Navisworks file that you currently have open. This tab also allows you to overwrite any files that you are creating and gives you the ability to increment the output files names. Finally, if creating a NWD, NWC, or NWF file with the Batch Utility you can select which product version the file will be created in through the File Version: drop-down in this tab.

The As Multiple Files tab of the Output section gives you all the same options as the As Single File tab but provides one additional option of placing the output files in the same directory as the source files you selected.

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Let's continue to create a native Navisworks file from a file selected.

5. In the Output area, click the As Multiple Files tab.

6. Click Output to same directory as source files radio button (see [Figure 4.9](#)).

FIGURE 4.8

Selecting the type of output and the output location for the tasks performed in the Batch Utility Once you have selected a location for your output file(s) you should note that the Run Command and Schedule Command buttons at the bottom of the dialog are now active.

Those buttons are inactive until the output location has been selected.

Finally, the Log area at the bottom of the dialog allows you to create Log files tracking the events in the Batch Utility dialog. This can be very helpful to determine if the Batch Utility that you created was successful or not.

- 7. Check the Log events to box.
- 8. Click Browse and navigate to the *Chapter04* folder.
- 9. In the “Save log as” dialog, under File name: type **Chapter 04 Log** and then click Save ([see Figure 4.10](#)).

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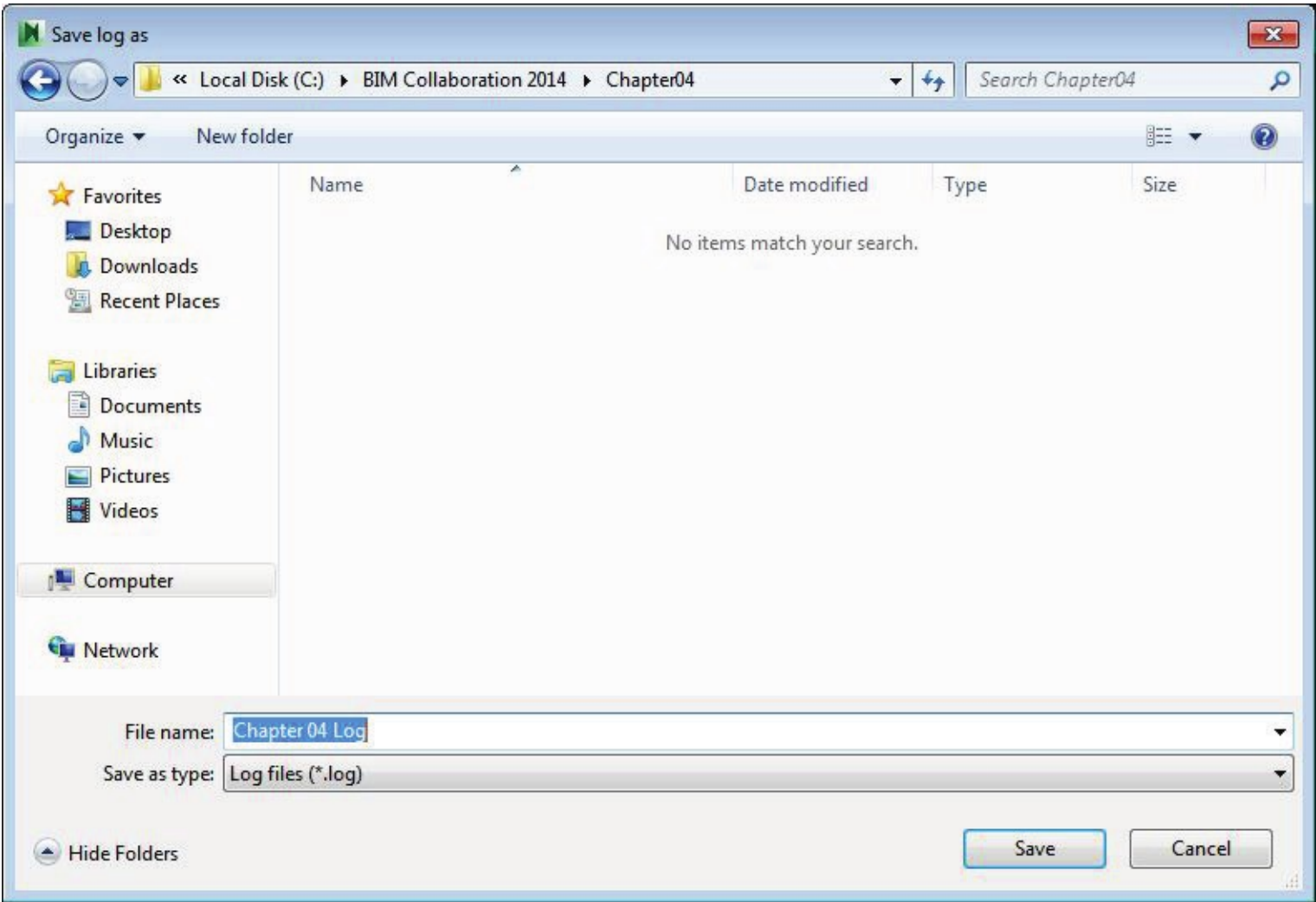


FIGURE 4.9

Creating a Log file to record tasks for the Batch Utility You are now ready to convert the non-native files to the native Navisworks file format.

However, this utility operates in “stealth” mode and it can be difficult to determine if it is finished with its processes or not. This means that although the Navisworks product is open, the Scene View will remain blank as Navisworks completes the tasks in the Batch Utility “behind the scenes”. Therefore, before running the Batch Utility you should open the Windows Task Manager and click the Processes tab and monitor the status of the *SceneConvertServer.exe* and *FiletoolsTaskRunner.exe* processes (see [Figure 4.11](#)).

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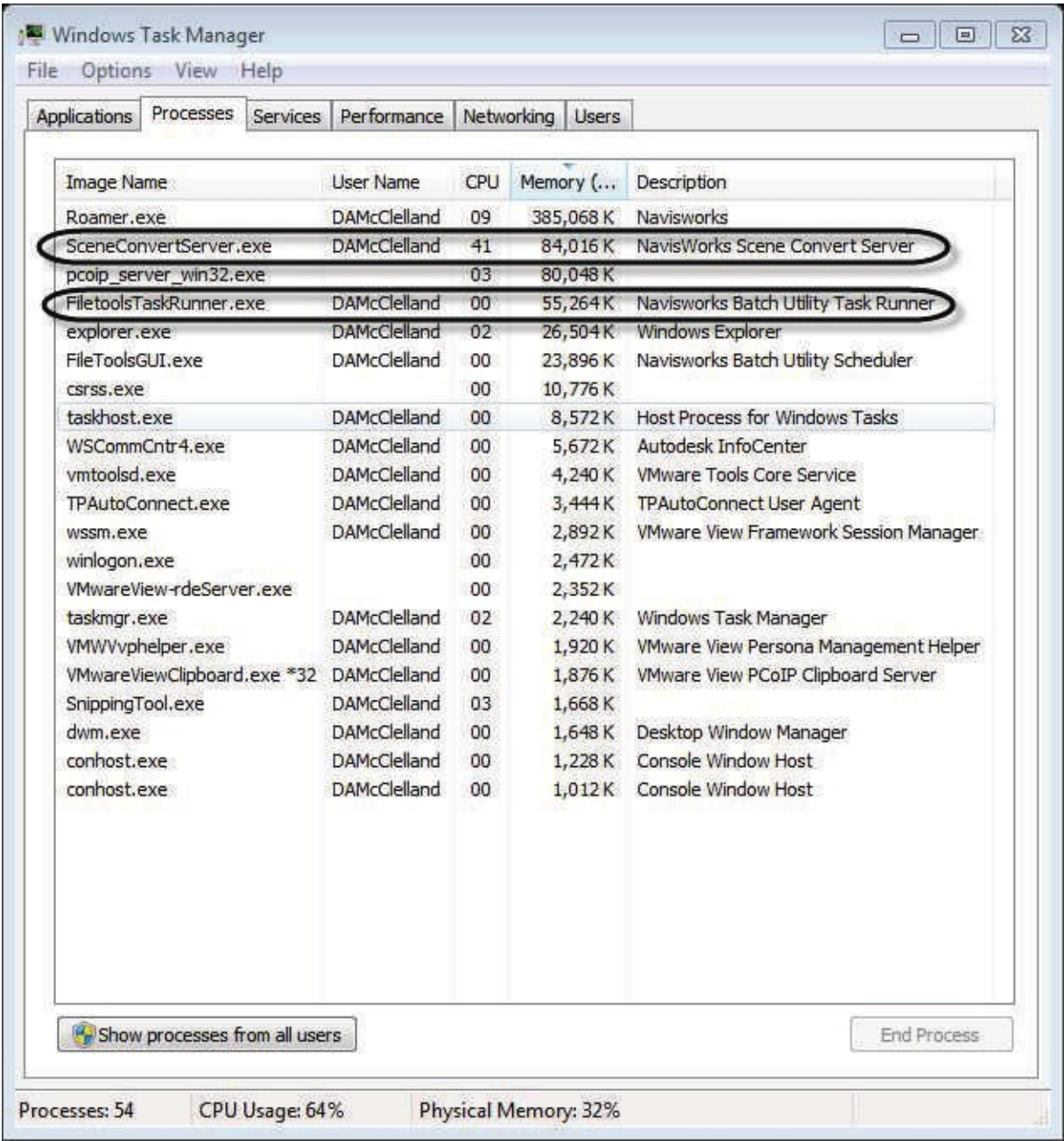


FIGURE 4.10

Batch Utility processes shown in the Windows Task Manager Once those tasks are no longer displayed in the Windows Task Manager the Batch Utility process is completed.

10. Open the Windows Task Manager, and then back in Navisworks, click the Run Command button.

Navisworks is now creating NWD and NWC files of the files you selected. Monitor the your Windows Task Manager to determine when the process is complete or alternatively you can look for the NWD and NWC files in the output folder that you selected (see [Figure 4.12](#)).

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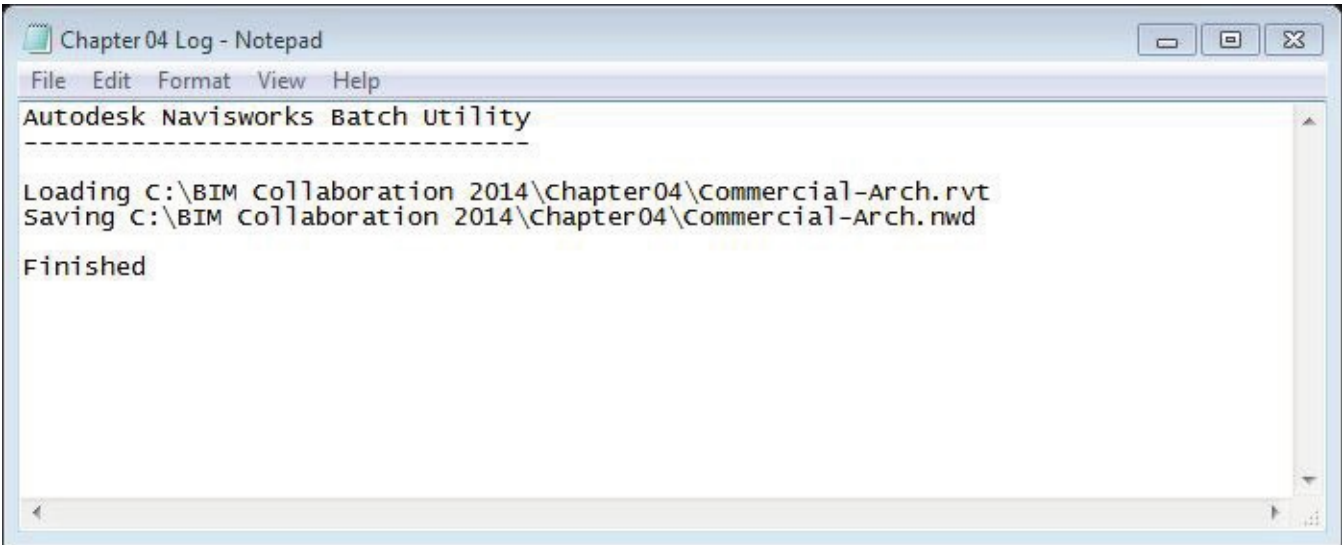
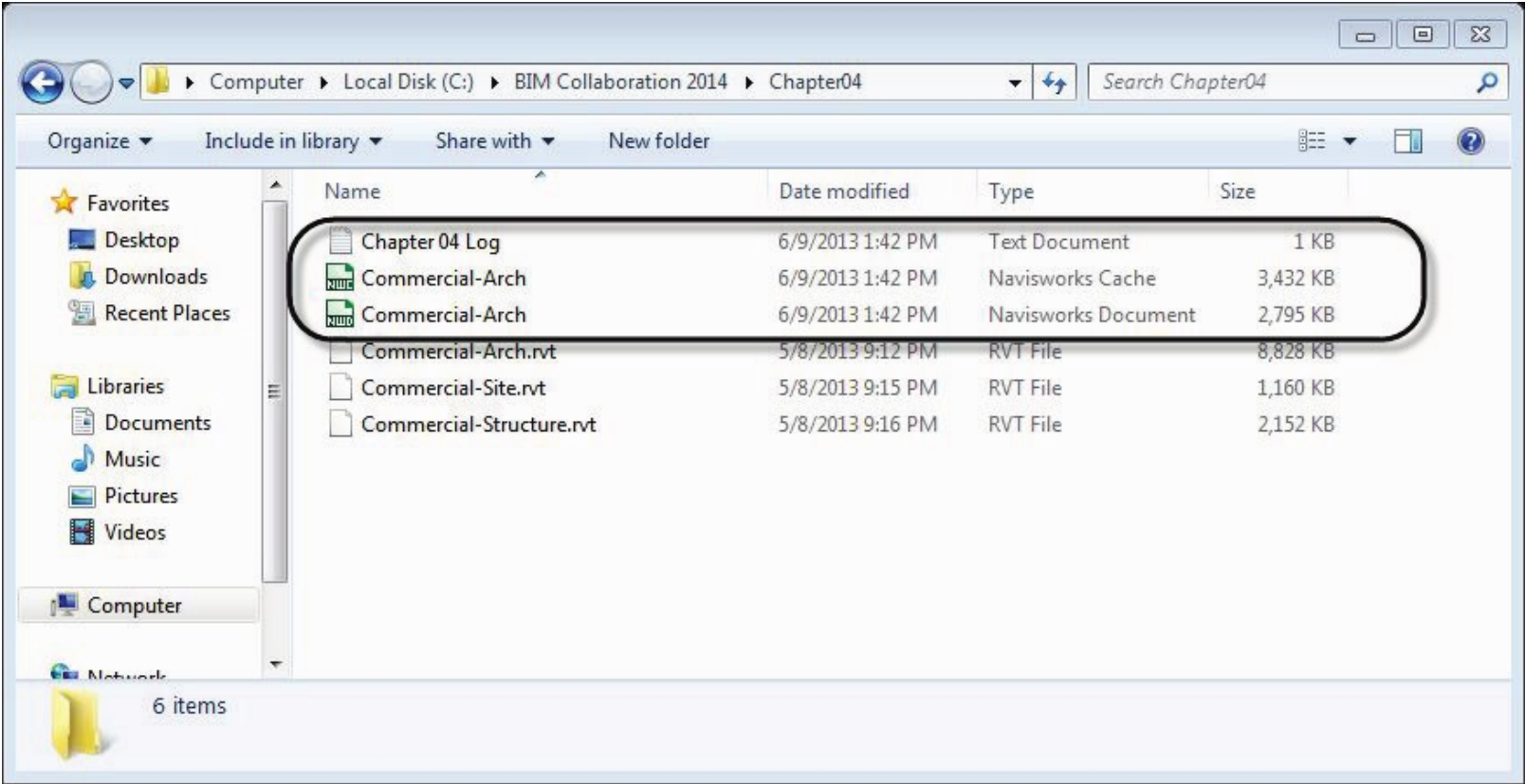


FIGURE 4.11

Files created by the Batch Utility

You can also open the log file you created and view the events of the Batch Utility (see [Figure 4.13](#)).

FIGURE 4.12

The results of the Batch Utility can be stored in a Log file 11. Close the Windows Task Manager, and also close the “Navisworks Batch Utility” dialog.

12. From the QAT click the Open icon.

13. Navigate to the *Chapter04* folder.

14. At the bottom of the “Open” dialog, from the Files of type drop-down choose: All Navisworks Files (*.nwd; *.nwf; *.nwc).

15. Select a Navisworks Cache file (NWC) and click Open.

16. Open the Navisworks Document (NWD) file next.

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Note that both the NWC and NWD file are similar in regards to the visual information created.

SCHEDULING BATCH PROCESSING

The Batch Utility function in Navisworks also gives you the ability to schedule Batch Utility events at a later time if you would like. This gives you the opportunity to perform specific functions after hours so that you are not tying up critical resources during working hours.

Note: Task Scheduling does not work for Windows XP/2000 users running local accounts (that is, not on a domain) without passwords.

To do this, click the Schedule Command button in the “Navisworks Batch Utility” dialog instead of the “Run Command” button. In the “Save task file as” dialog, type in a file name for the event you are scheduling, browse to the folder where you wish to save your scheduled event and then click Save.

The Schedule Task dialog will appear and prompt you to enter a Task Name and your domain password. After entering that information and clicking OK in the dialog, another dialog will appear based on the Task Name that you previously entered. In this dialog you can schedule the task and configure settings of the task.

Finally, you can use command line switches with the Batch Utility. To learn more about the command line switches type: **Command Line Options for Batch Utility** in the Search field of the Navisworks Help.

Note: In order to perform the tasks within the Batch Utility, either running a specific task or running scheduled tasks the Navisworks product must be open or the task(s) will not be completed.

As you can see, we can open many different kinds of files in Navisworks. Now that you have some firsthand experience with the user interface and with loading and merging files, you are ready to begin exploring the product a little more thoroughly.

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SUMMARY

Navisworks recognizes many different files type and can read those files directly into the Navisworks product.

Native Navisworks files will be created when a file is opened.

If a native file has already been created, Navisworks will only recreate the file if the source file has changed.

You can combine multiple files into a single Navisworks file using append and merge options.

The Batch Utility tool can be used to append or merge Navisworks project files together in an automated way.

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Chapter 5

Model Navigation

INTRODUCTION

This chapter is designed to acquaint you with the navigation tools that can be used to move through your project model. Scene View tools can help you zero in on a starting point to begin your project model navigation. The Navigation tools help you explore your project model in a variety of ways. The overall goal of this chapter is to help you understand how to navigate in your project model more efficiently and effectively.

OBJECTIVES

To understand Navisworks model navigation. Topics we will explore include:

- Adjust the background to suit your needs.

- Create Viewpoints to quickly return to an important area in your project model.
- Create Animations from saved Viewpoints.
- Use Reference Views to quickly move from one part of a large project model to another.
- Create Section Views to show details of the project model.

NAVIGATION TOOLS

Unlike Scene View tools, which gives you the ability to Zoom, Pan, or Orbit your Scene View, navigation tools give you the ability to navigate through your project model.

Navigation tools can help you explore details of your model. Several navigation tools can help you navigate through your project model and some of the tools can help you section your project model or create Viewpoints of specific areas of your model. As you navigate through your model you can record your path to replay for the project team later. You can also create animations from specific Viewpoints if you do not want to take time to record your navigation through the project model. Let's continue building on some of the concepts

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we have discussed up to this point in the previous chapters and learn how the navigation tools can help us navigate through a project model.

OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for

instructions.

1. Launch Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

3. In the Open dialog, browse to the location where you installed the dataset files.

4. In the *Chapter05* folder, select the *05 Project Model.nwf* file and then click Open.

Note: Use the Files of type: drop-down in the Open dialog to either display all the Navisworks files in a folder or isolate particular types of Navisworks files, in this case NWF files.

5. Click Home above the ViewCube.

You should now be looking towards the front of the building. Your project model should consist a building located on the project site. The background color of the project model is currently black.

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Note: By default when you open the Navisworks product, without a project model loaded, the background color will be black. The background color is stored in the project model and is not a system or program default. Therefore, you cannot change it until a Navisworks file has been opened.

Let’s look at how we can change the background color to something that might be more appealing as we are navigating through the project model.

BACKGROUND SETTINGS

There are several options available to you when setting your background color. You can choose from: Plain Background, Graduated Background or Horizon Background. A Plain Background will fill the Scene View with the color you have selected. The Plain Background is the default. A Plain Background can be used with 3D models and 2D sheets. A Graduated Background will fill the Scene View with a smooth gradient between two colors that you have selected. Those colors are identified as a Top and Bottom

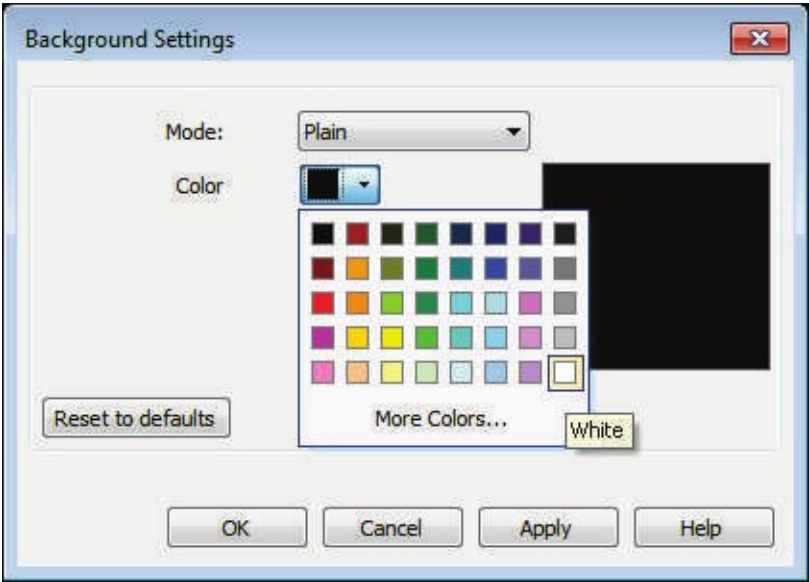
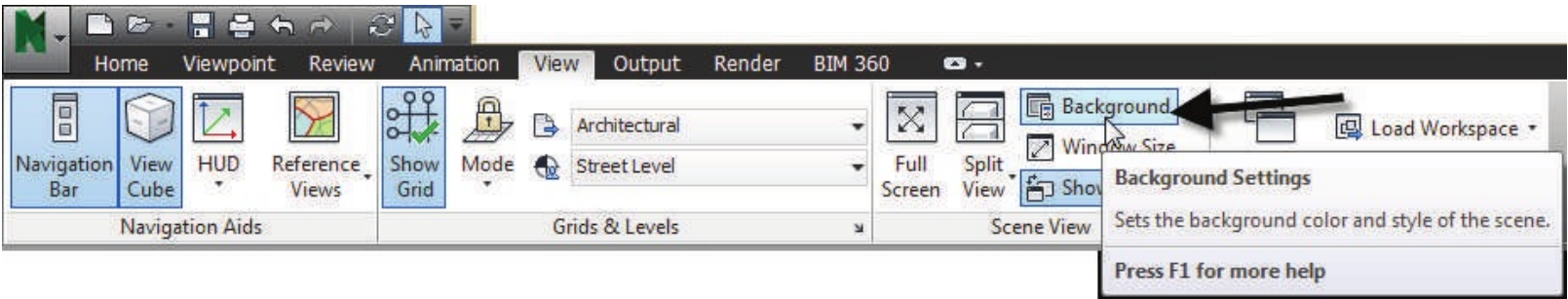
Color. A Graduated Background can also be used with 3D models and 2D sheets. A Horizon Background allows the background of a 3D Scene View to be split across a horizontal plane providing the effect of the sky and the ground. This is an artificial horizon and by default the horizon (Up) will be set based on the Orientation of the project model. The Orientation of the project model can be adjusted through the File Options. Please refer to a previous chapter discussion on Orientation. A Horizon Background is not available in orthographic mode or with 2D

sheets.

Note: The artificial horizon is merely a background effect and does not represent a physical ground plane.

The colors or settings of the background are a matter of personal preference. In the steps below we discuss how to change the color of the background but we will leave it up to you to determine if a Plain, Graduated, or Horizon background would be the best and to experiment with the color settings to determine which Background suites your personal preference.

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1. On the View tab, on the Scene View panel, click Background ([see Figure 3.1](#)).

FIGURE 5.1

A project model must be opened before the Background can be changed TIP: You can right-click in the Scene View to select Background.

In the “Background Settings” dialog use the Mode drop-down to make your selection.

2. Click the Color drop-down and click White (last color, last row) and then click OK (see [Figure 5.3](#)).

FIGURE 5.2

Change background color to white

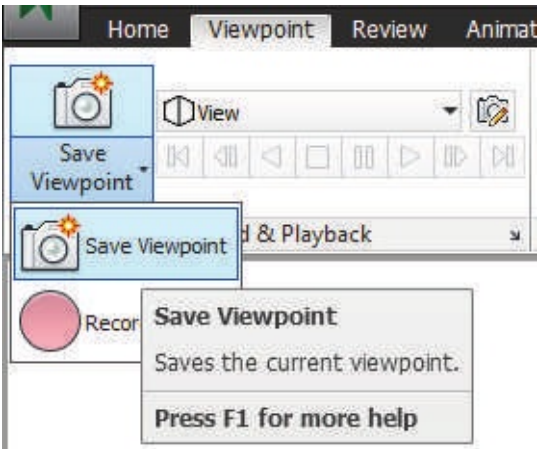
The Background of the project file has now been set to white providing more contrast to your project model. Feel free to use a different color or mode if that is your preference.

VIEWPOINTS

When you are navigating through your model you might want to “bookmark” a particular location that you would like to come back to later. You can do that by creating a Viewpoint.

Viewpoints are a “snapshot” of the Scene View. Viewpoints can even be combined to form Animations. We will discuss that later in this chapter. Viewpoints can also be saved with redlines and comments allowing specific thoughts to be shared with the project team at a later time. We will discuss Redline tools later in this book.

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Note: Viewpoints (and Redlines) are independent of the project model geometry and saved in an NWF file. This means that if you save a Viewpoint of your project model, the Viewpoint will always remain the same even though the underlying project model geometry changes throughout the course of the project. This allows you to see how the project model has developed over the course of time.

Let's explore how Viewpoints can be created and used for navigation in a project model.

Currently, you should be looking at a southeast view of your project model in a 3D view.

Let's save this Viewpoint. There are two ways you can save a Viewpoint. We will review both now.

1. On the Viewpoint tab, on the Save, Load & Playback panel, click the lower half of the split button (Save Viewpoint) and then choose: Save Viewpoint (see [Figure 5.4](#)).

FIGURE 5.3

Viewpoints of your project model can be saved at any time The Save Viewpoint window will appear and Navisworks will have the name of the Viewpoint highlighted for editing.

2. Type: **3D View** and press ENTER.

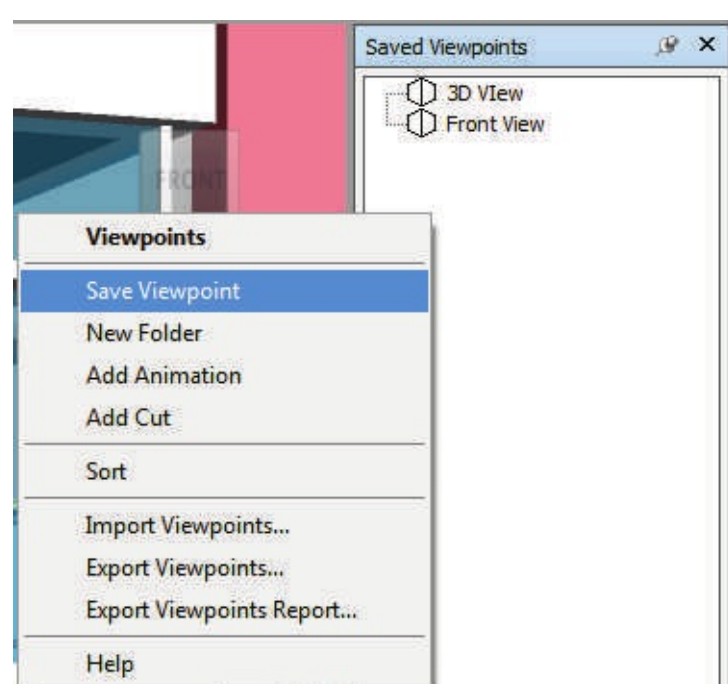
You have created your first Viewpoint. We will come back to this Viewpoint later. Let's look another method of creating a Viewpoint.

3. On the ViewCube click the Front view.

4. On the Viewpoint tab, on the Save, Load & Playback panel, click the upper half of the split button: Save Viewpoint.

Another Viewpoint has been created and again Navisworks has highlighted the name of the Viewpoint, in the Saved Viewpoints window, for editing.

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5. Type: **Front View** and press ENTER.

Let's create one more Viewpoint and using a different method.

If you have not already done so, Dock your Saved Viewpoints window to the side of your screen. Also make sure to pin it open with the window Auto Hide tool. (Refer to the [“Dockable Windows and the Docking Tool”](#) and the [“Auto-Hide \(Pin\)”](#) topics in [Chapter 2](#) for more information).

6. Use the Zoom Window tool to zoom to entrance of the building.

TIP: When using the Zoom Window tool here, make sure to keep the window box above the site plan or a portion of the Scene View might be below grade. If you are not satisfied with your zoom you can use the Zoom tool again, or use the Pan or Orbit tools as well. If you would like to start over simply click the Front View in the Saved Viewpoints window and use the Zoom tool again.

Once you are satisfied with the result of your zoom you will need to save another Viewpoint.

Let's look at yet another way we can save a Viewpoint.

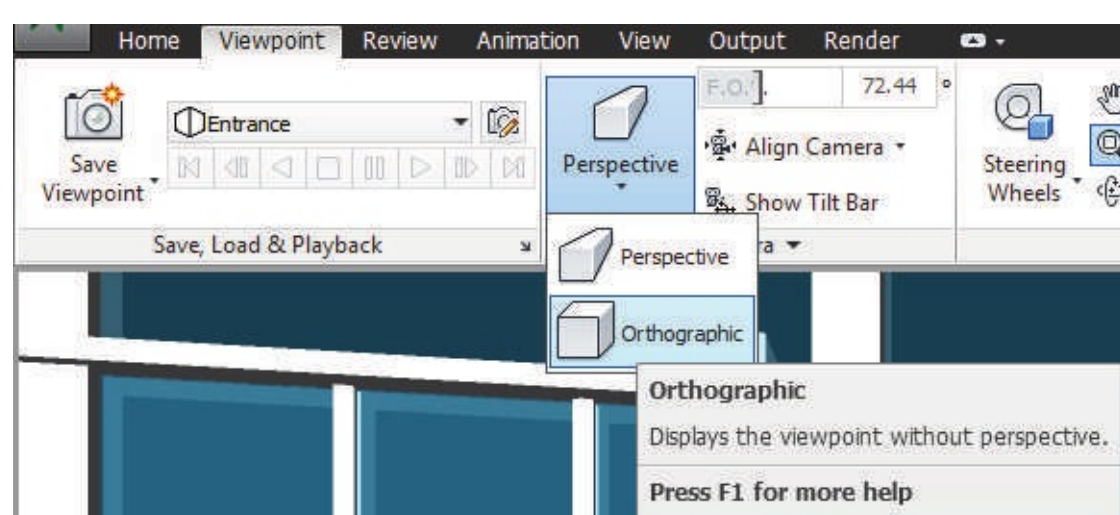
7. In the Saved Viewpoints window right-click anywhere in the window and then click Save Viewpoint (see [Figure 5.5](#)).

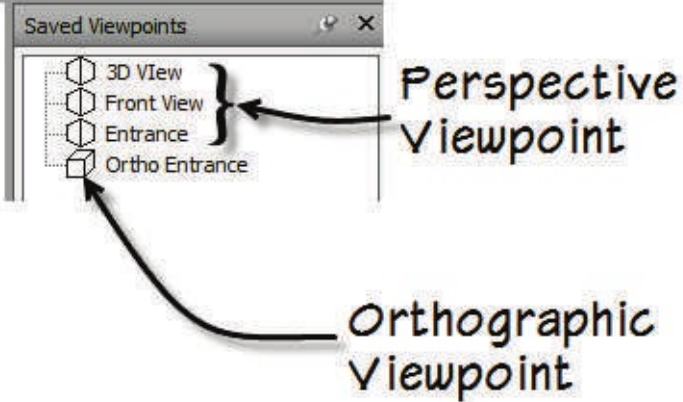
FIGURE 5.4

Named Viewpoints can be found in the Saved Viewpoints window 8. Type **Front Entrance** and press ENTER.

You now have three saved Viewpoints. Let's create one more Viewpoint and then we'll review the different types of Viewpoints.

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9. On the Viewpoint tab, on the Camera panel, click the Perspective drop-down and then choose: Orthographic ([see Figure 5.6](#)).

FIGURE 5.5

Views can be set to Orthographic or Perspective You should notice that your Scene View changes immediately from a Perspective view to an Orthographic view still focused on the entrance of the building. Make any adjustments you find necessary to fine-tune the view.

10. In the Saved Viewpoints window right-click anywhere in the window and then click Save Viewpoint, type: **Ortho Entrance** and press ENTER.

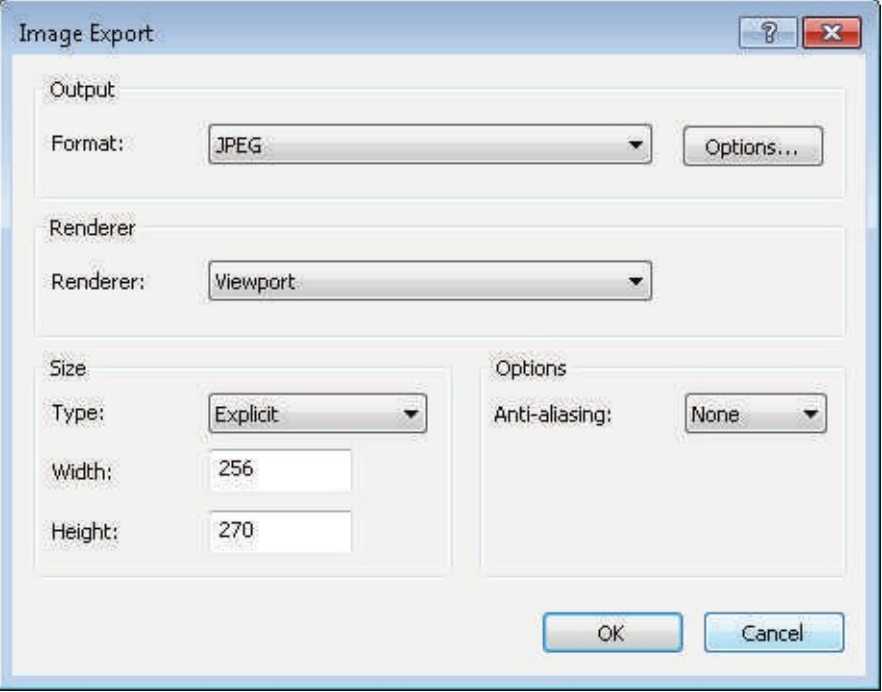
You have now saved four total Viewpoints. However, in the Saved Viewpoints window you should notice that the first three Viewpoint symbols do not match the one we just created.

The Viewpoint symbols represent the type of Viewpoint saved, either Perspective or Orthographic ([see Figure 5.7](#)).

FIGURE 5.6

Different view types can be saved as Viewpoints Once Viewpoints have been saved, you can use them to move quickly to various locations of your model with just a few clicks. You can also delete unwanted Viewpoints as well.

11. In the Saved Viewpoints window click Ortho Entrance and right-click and choose: Delete.



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TIP: Double clicking a Saved Viewpoint allows you to rename the Viewpoint.

Notice that even though the Viewpoint was deleted your Scene View did not change. Take time if you would like to click on your Saved Viewpoints to see how quickly you can move from location to location.

12. In the Saved Viewpoints window click Entrance.

Once Viewpoints have been created or saved they can be exported to an image file. This allows you to share project information with the project team.

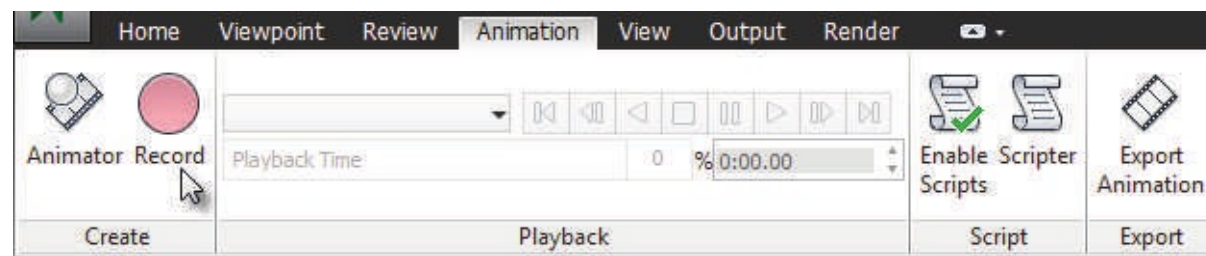
13. On the Output tab, on the Visuals panel, click Image.

In the “Image Export” dialog you have several options when exporting your image (see [Figure 5.8](#)).

FIGURE 5.7

Saved Viewpoints can be exported as image files At the top of the dialog, we have a choice of three standard file formats: Windows Bitmap, JPG and PNG. If you choose JPG or PNG, they each have options that you can access with the Options button. Options include the amount and

For Rendering, there are two options: Viewport and Autodesk. Selecting Viewport allows you to quickly render an image with no enhancement applied to the image. It is basically a screen capture. When using the Autodesk renderer, any material enhancements that are applied to the project model in Navisworks will also be applied to the exported image.



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Use the Size Type drop-down to define how the size of the exported image will be configured. If you want to set the width and height (in pixels) independently, choose Explicit. Choosing Aspect Ratio will link the Width and Height together so that editing one will affect the other proportionally. If you want to simply use the size of the existing view window, choose View and the dimension fields will disable.

Finally, you can choose the amount of Anti-aliasing from the drop-down. This option is only available when Viewport has been selected as the Renderer. Anti-aliasing will smooth the edges of the exported image. The Anti-aliasing drop-down allows you to select a range from 2x to 64x. However, the higher the number the longer the image will take to export.

Feel free to continue creating and exporting viewpoints before continuing. You can also use Viewpoints to create Animations. In the next topic we will see how we can create Animations to navigate through our model using the Viewpoints we created.

ANIMATIONS

There are a few different ways that animations can be created within Navisworks. One way is through the Animation tab, Create panel, Record tool (see [Figure 5.9](#)).

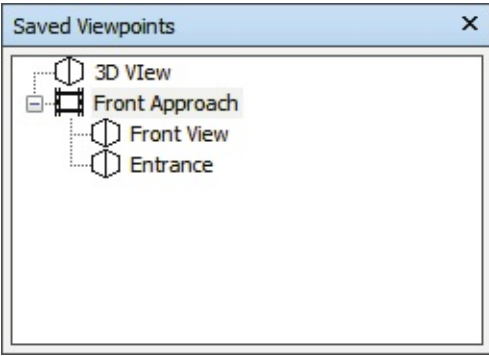
FIGURE 5.8

You can Record your project model walk through Just before you begin your walk through you can click Record to begin recording your movement through your project model. Walking through a project model requires a steady hand and it might even require several attempts or multiple animations to accomplish the particular walk through that you want to create. Rather than provide a tutorial on this feature, you are welcome to try this on your own.

Another method to create an animation allows you to let Navisworks do the “heavy lifting”

for you. You can use your existing Viewpoints as keyframes in the animation and allow Navisworks to “interpolate” between them in order to create the Animation. To avoid having an undesirable walk path, this might require multiple Viewpoints. For example, if you want

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to create an animation simulating walking around the exterior of your project model you might need to create a Viewpoint on the North, Northeast, East, etc. as opposed to just the North, East, South, etc. The North, East, South approach might cause Navisworks to interpolate the shortest distance between two points is directly through the building. This defeats your goal of creating an animation simulating walking around the building. In that particular case the extra Viewpoint, Northeast (perhaps the corner of the building), before going to an East Viewpoint will make all the difference in the world for your animation. Let's look at how we can use Viewpoints to create Animations.

1. In the Saved Viewpoints window right-click anywhere in the window and choose: Add Animation, type: **Front Approach** for the name and then press ENTER.

We have now created an Animation. Notice it has a different icon than the other two. Our animation is empty and therefore the toggle buttons to play the Animation are grayed out and not available. Let's add some Viewpoints to this Animation.

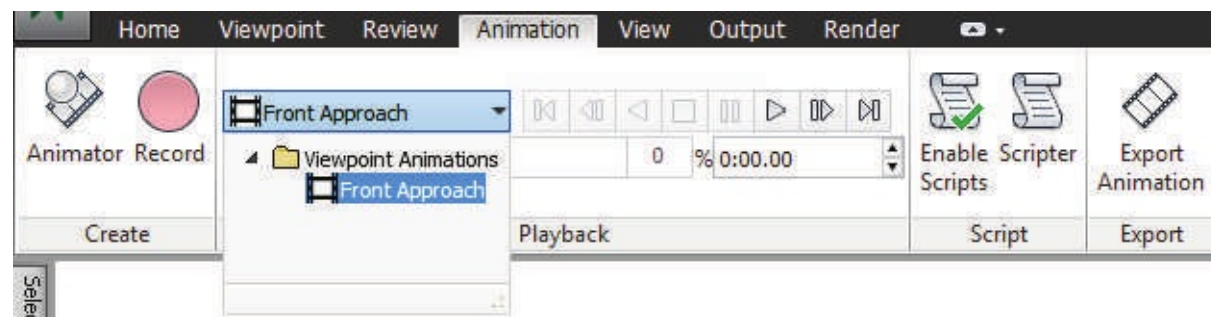
2. In the Saved Viewpoints window, drag and drop Front View into the Front Approach Animation.
3. Next, drag and drop Entrance into the Front Approach Animation (see [Figure 5.10](#)).

FIGURE 5.9

An Animation that has been created using Saved Viewpoints You created an Animation with two Saved Viewpoints that you previously created. Those Viewpoints will remain available to you even though they are now contained in the Animation. To return to either of those Viewpoints you can simply click one of the Viewpoints under the Animation.

Now let's play the Animation that we created.

4. On the Animation tab, on the Playback panel, click the Animation drop-down and expand Viewpoint Animations and then click Front Approach (see [Figure 5.11](#)).



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FIGURE 5.10

Animations can be selected to be played 5. On the Animation tab, on the Playback panel, click Play.

The animation now begins walking you towards the entrance of the building. Using just two Viewpoints in Navisworks you were able to create a simple animation that walked you to the entrance of the building from another point that was selected. However, depending on the settings, the walk might seem to have gone at a snail's pace, in other words a crawl and not a walk.

In addition, depending on your Hardware you might have witnessed some drop out as you were moving towards the entrance of the model. This would have been represented by the Pencil Progress Bar shown in the Status Bar (refer to the [“Status Bar—Performance](#)

[Indicators”](#) topic in [Chapter 2](#) for more information. To eliminate the drop out the Frame Rate in the File Options can be decreased. To decrease the Frame Rate through the File Options please refer to the Global Settings and File Options chapter.

Let's look at how we can increase the speed of the animation.

6. In the Saved Viewpoints window, select Front View, right-click and choose: Edit.

Note that the Linear Speed (ft/sec) of this Viewpoint had a very low value and thus the animation progressed very slowly (see [Figure 5.12](#)).

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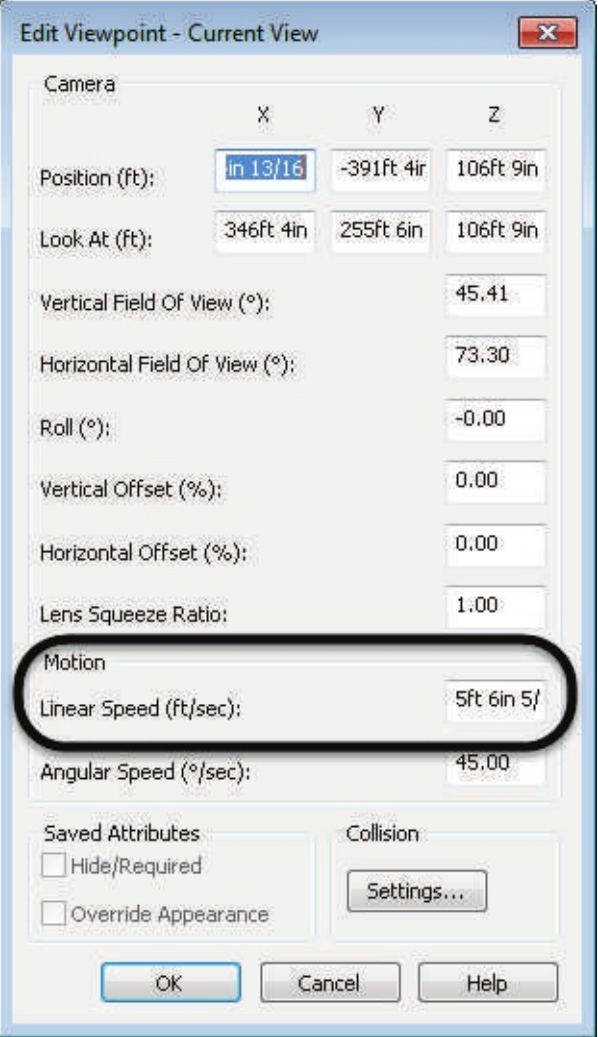


FIGURE 5.11

The Linear Speed of a Saved Viewpoint can be adjusted to allow faster navigation Let's modify the Linear Speed of the Viewpoint to quicken the pace of the Animation.

- 7. In the Linear Speed box type: **100'** and then click OK.
- 8. On the Animation tab, on the Playback panel, click Play.

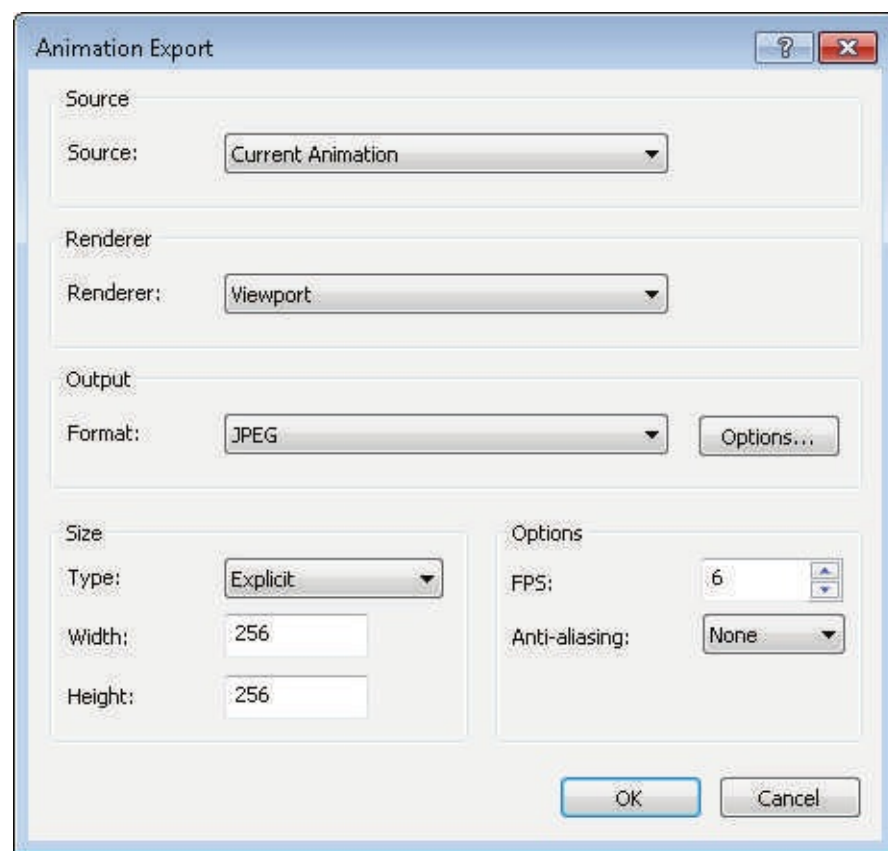
You should now notice that the speed of the animation is more brisk compared to when it was initial y run. If there had been other saved Viewpoints in this Animation and you wanted them all to appear at the same speed you would have had to edit the Liner Speed of each individual Viewpoint in the Animation and set the Linear Speed the same. Otherwise the various portions of the animation would progress at different speeds.

Once an Animation has been created or saved it can be exported as a sequence of image files or a single AVI file. This allows you to share project information with the project team.

- 9. On the Output tab, on the Visuals panel, click Animation.

Once the Animation Export dialog is opened you have several options when exporting your Animation (see [Figure 5.13](#)).

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FIGURE 5.12

Saved Animations can be exported

You should note that the “Animation Export” dialog is very similar to the “Image Export”

dialog with the exception of a few extra options. For example, the source defaults to the Current Animation, but you can also choose from Current Animator and TimeLiner Simulation. These will be discussed later. Rendering and Size options are the same as the “Image Export” dialog. As before, if you choose any format other than Windows Bitmap, the Options button will become available to configure options specific to that format. In the “Options” section of the dialog, the FPS setting is “Frames Per Second.” With raster image output (PNG, JPG and BMP) this will determine how many individual image files will be generated. For AVI, it will set the frames within the animation file.

Note: If a Video Compressor is not available on your computer the Configure button will be unavailable.

Feel free to continue making adjustments to your animations and exporting the results if you like.

COLLISION

One of the several benefits of Navisworks is the ability to navigate through a project model to see how the building components interact with each other. However, that experience can be enhanced when a graphical representation of a building occupant can be applied allowing you to navigate through the project model to see how the building components might • Understanding Navisworks •

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interact with an occupant. Navisworks allows you to define an occupant through the Viewer volume or a Third Person. Either method will respect the building components and identify when collisions occur between building components and an occupant. Let's review how we can define the Viewer or the Third Person to help identify potential collisions.

1. In the Saved Viewpoints window, click Entrance and then right-click and choose: Edit.

Note: If you do not have Saved Viewpoints in the project model to start with, you can simply right-click in the Scene View, select the Viewpoint fly-out, and then choose: Edit Current Viewpoint. In addition, once you have begun to navigate through the model and would like to make changes to your Collision settings, it is recommended that you right-click in the Scene View, and from the Viewpoint fly-out, choose: Edit Current Viewpoint. Make any modifications to your Collision settings there.

2. In the “Edit Viewpoint – Entrance” dialog, under Collision, click Settings.

Note: The “Collision” dialog is only available for 3D project models.

There are several settings that can be addressed through the “Collision” dialog. First, if you do not want to enable Third Person, or apply an Avatar, you can define the size of the Viewer. If you would like to have a graphical representation of a building occupant that respects the building components you can enable that through the Collision dialog as well.

Let's look at doing both of those now.

3. In the Collision dialog apply the following settings (see [Figure 5.14](#)).

Collision—Enabled

Gravity—Enabled

Auto Crouch—Not enabled

Viewer settings

Radius (ft)—2ft 0in

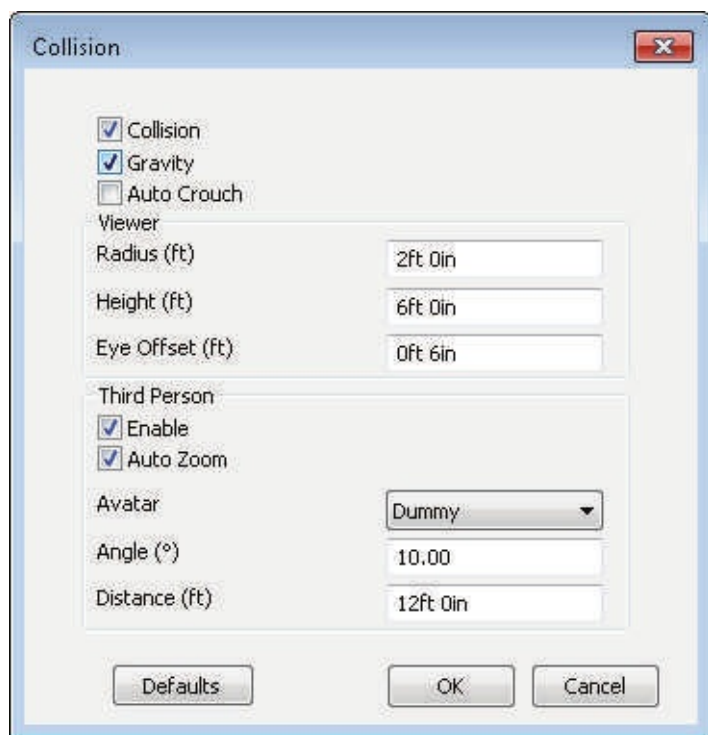
Height (ft)—6ft 0in

Eye Offset (ft)—0ft 6in

Third Person settings

Enable—Enabled

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Auto Zoom—Enabled

Avatar—Dummy (or an Avatar of your choice)

Angle (°)—10.0

Distance (ft)—12ft 0in

Note: Knowing how Display Units are configured in Navisworks will help you input dimensional values correctly. For example, if your Display Units are set to Feet and Fractional Inches, as they have been herein, you can simply type 0.25 for 0ft 3in. If Display Units are set to Meters and 0ft 6 in is entered this will automatically be converted to 0.15 m.

FIGURE 5.13

Configure your collision settings

4. Click OK twice.

Collision Settings are not immediately apparent in the Scene View. In order to utilize the settings we just modified we will need to invoke the Walk tool.

5. On the Viewpoint tab, on the Navigate panel, click Walk and begin walking toward the entrance of the

building.

You should first note that your Avatar will respect Gravity and come to the ground before it begins moving forward. Once on the ground, and moving forward, it will even walk up the steps towards the entrance. Once to the entrance, the Avatar will stop since Collision was enabled. Collision prevents masses from passing through objects. Let's look at how we can modify the Collision settings to walk through the entrance glass.

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6. On the Viewpoint tab, on the Navigate panel, click the Realism drop-down and deselect Collision and then click Realism again to retract the drop-down.

Note that Gravity is no longer enabled. Gravity and Collision work in conjunction with each other.

7. Walk through the entrance glass into the Lobby of the building.

8. Once in the Lobby, on the Viewpoint tab, on the Navigate panel, click the Realism drop-down select Collision and then click Realism again to retract the drop-down.

You can continue to navigate through the model exploring the model and other navigation tools as you would like.

NOTE: Once satisfied with your Collision Settings you can set those as a global setting for all users of the Navisworks. This can be done through the Options Editor. To learn more about global settings and the Options Editor please refer to the [“Global Settings”](#) topic in [Chapter 3](#).

ADDITIONAL NAVIGATION TOOLS

As you navigate through the model you might become “lost”. There are few tools that you can use to help you find where you are in the project model.

HUD (HEAD-UP DISPLAY)

HUD is displayed in the Scene View and can provide you “You Are Here” information as you are navigating through the project model. This information can be in three forms.

XYZ Axes—Select this option to show the X, Y, and Z orientation of the camera.

Position Readout—Select this option to show the absolute X, Y, Z position of the camera.

Grid Location—Select this option to show the grid and level location of the camera in relationship to the active grid in the Navisworks model. This is based on the closest grid intersection of the camera position and the closest level below the camera position.

1. On the View tab, on the Navigation Aids panel, click the HUD drop-down and then select XYZ axes, Position Readout, and Grid Location and then click HUD again to retract the drop-down.



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Depending on how far you navigated into the model in the steps above and the direction the camera was looking the HUD will indicate your position in the Scene View ([see Figure 5.15](#)).

FIGURE 5.14

HUD shown in the Scene View can help you determine your location **REFERENCE VIEWS**

Reference Views can be a quick way to move from one part of a large project model to another part in either in a Plan View or a Section View. The Reference Views are fixed views contained in a Dockable Window. The Zoom, Pan, or Orbit tools cannot be used in the Reference Views. Within the Reference Views a triangular marker will represent your location in the project model. This marker will move as you navigate through the model. In addition, the marker may also be dragged in the Reference Views to a new location and the camera in the Scene View will automatically update to that location.

2. On the View tab, on the Navigation Aids panel, click the Reference Views drop-down and select Plan View, Section View, or both and then click Reference View again to retract the drop-down.

3. Use a Reference View to move the camera from one part of the project model to another, whether through the Plan View, Section View, or both.

4. Use the Walk tool to see how the triangle marker updates as you move around in the model.

There is a Contextual Menu available through the Reference View. You can access the Contextual Menu by right-clicking in either the Plan View or the Section View window. The Contextual Menu offers the following options.

Look From—Select this option change the Reference View to one of Navisworks preset viewpoints (i.e. Top, Bottom, Left, Right, etc.). **Current Viewpoint** sets the Reference View to the Viewpoint active in the Scene View.

Update Current Viewpoint—Select this option to set the current Viewpoint in the Scene View to the view in the Reference View.

Edit Viewpoint—Select this option to open the Edit Viewpoint dialog in order to modify the settings for the Reference View.

Lock Aspect Ratio—Select this option to match the aspect ratio of the Reference View to the current Viewpoint in the Scene View. This typically results in a gray strips appearing on each side or the top and bottom of the Reference View.

Refresh—Select this option to redraw the Reference View based on the current settings.

You can continue to navigate through the model exploring the model and the HUD and Reference Views as you would like.

ENABLE SECTIONING

There are two distinct ways to section a Navisworks project model. You can use a Section Plane or a Section Box. Either method allows you to view section cuts through the project model. Sectioning allows you to peer inside the project model without having to Hide items to do so.

There are six (6) Section Planes available. When a Section Plane is enabled, you can use that plane to cut through the project model in the Scene View while you are still able to navigate around in the Scene View. Section Planes can be turned on in conjunction with other Section Planes and the Alignment of the Section Plane can be selected to meet your needs.

Section Planes can also be linked together to form one a single Section view.

The Section Box allows you to focus on a specific and limited area of the project model. As the Section Box is moved around, only the geometry within the Section Box is visible in the Scene View.

Gizmos help move the Section Plane or Section Box in the X, Y, and Z directions. There are three types of Gizmos available when sectioning, a Move Gizmo, a Rotate Gizmo, and a Scale Gizmo. Each Gizmo displays colored axes and each Gizmo displays a different background associated to the Gizmo depending if the Move, Rotate, or Scale Gizmo has been invoked ([see Figure 5.16](#)).

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FIGURE 5.15

Gizmos can aid with Sectioning

Let’s review Section Planes and the Section Box.

5. In the Scene View, above the ViewCube click the Home icon ViewCube.

If the ViewCube is not visible, enable the ViewCube from the View tab on the Navigation Aids panel. Now let’s turn off the Third person.

6. On the Viewpoint tab, on the Navigate panel, click the Realism drop-down and deselect Third Person and click Realism again to retract the drop-down.

7. On the Viewpoint tab, on the Sectioning panel, click Enable Sectioning.

The Sectioning Tools contextual tab appears and a light blue wire frame Section Plane and associated Gizmo appears as well (see [Figure 5.17](#)).

NOTE: If the section plane does not appear, click Fit Selection on the ribbon.

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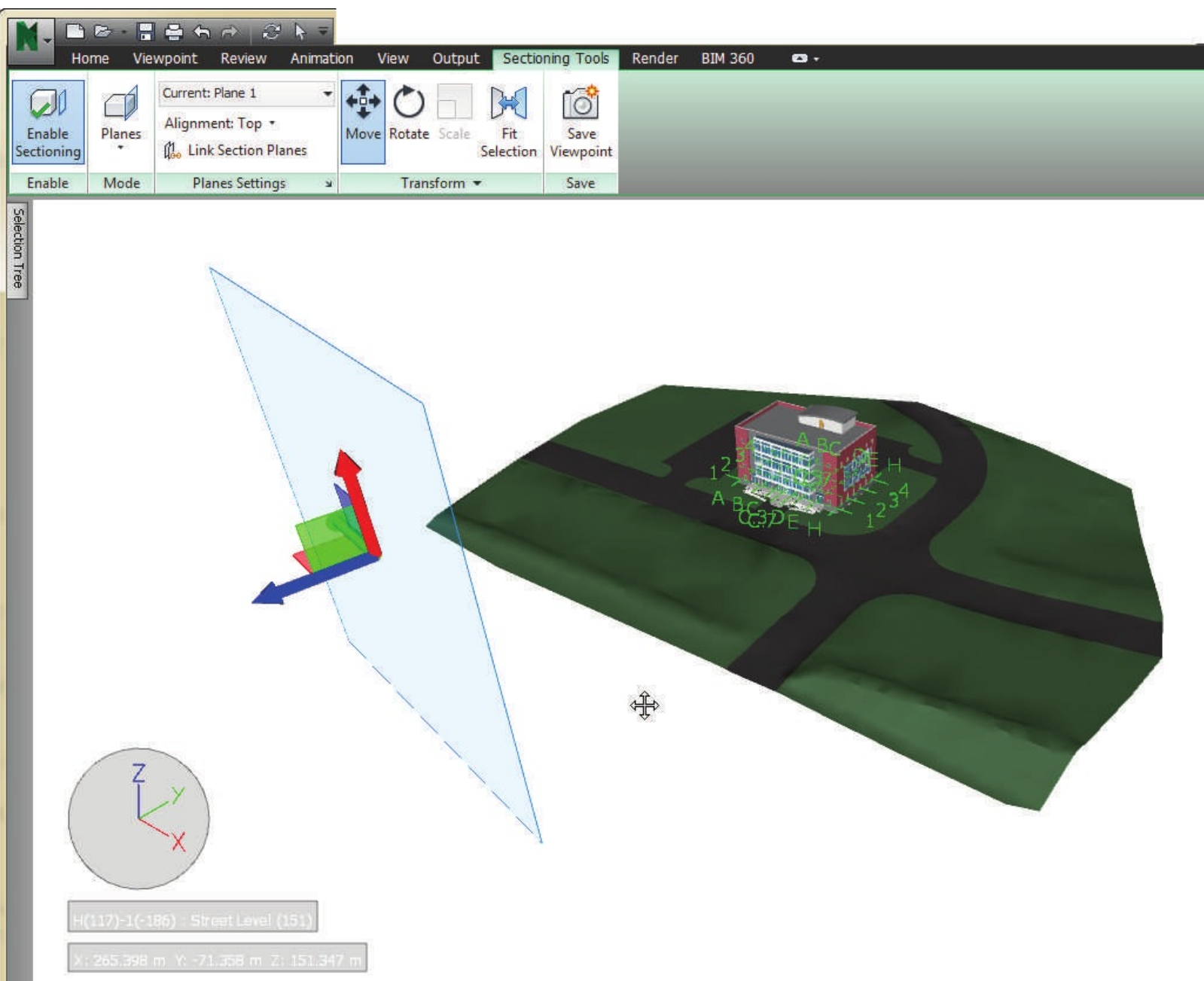


FIGURE 5.16

A Section Plane with the Sectioning Tools contextual tab 8. Hover over the dark blue axis of the Gizmo until the hand icon is displayed and then click and drag to move the Gizmo toward the project model until the project model is sliced in half (see [Figure 5.18](#)).

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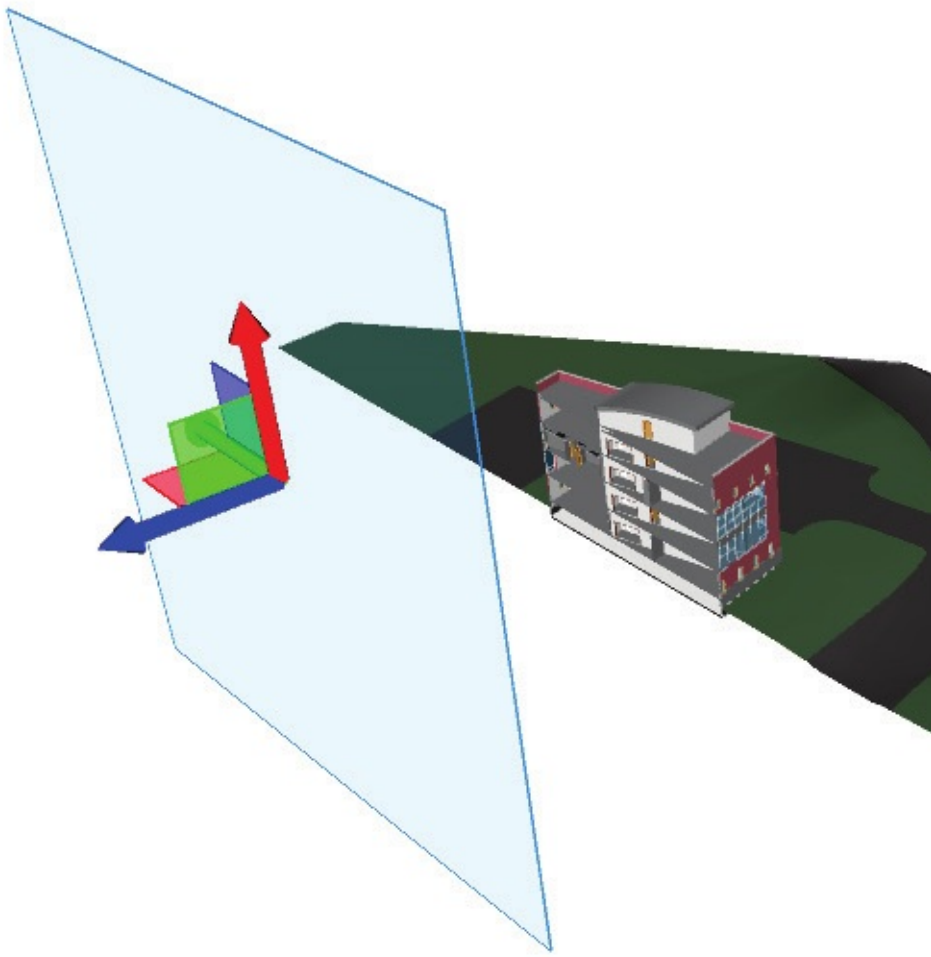


FIGURE 5.17

A Section Plane slicing the project model Now that we have sliced the model one way let's look at how we can slice the model in another way and then link the two Section Plans together to form one section view.

9. On the Sectioning Tools contextual tab, on the Plane Settings panel, click the Current: drop-down, turn off Plane 1 by clicking the light bulb adjacent to Plane 1, and then click then click the Current: drop-down again to retract the drop-down.

The Section Plane should have disappeared and the project model should be in full view.

Let's modify another Section Plane.

10. On the Sectioning Tools contextual tab, on the Plane Settings panel, click the Current: drop-down.

11. Turn on Plane 2 by clicking the light bulb adjacent to it, and then click on Plane 2 to select it.

12. Hover over the dark blue axis of the Gizmo until the hand icon is displayed and then click and drag to move the Gizmo up toward the project model until the project model is sliced in half (see [Figure 5.19](#)).

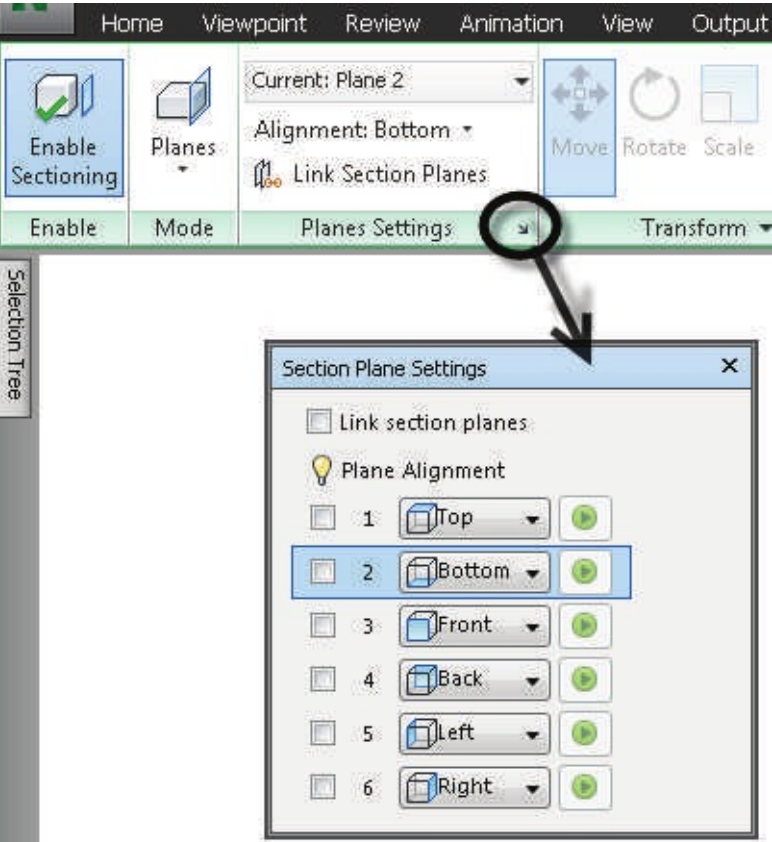
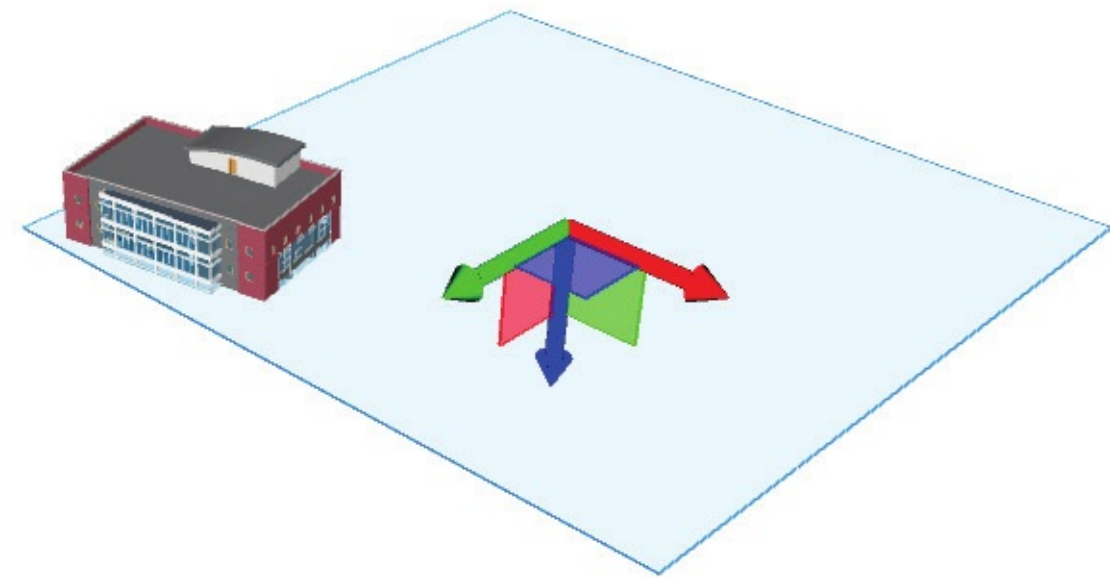


FIGURE 5.18

A Section Plane slicing the project model 13. On the Sectioning Tools contextual tab, on the Plane Settings panel, click the Current: drop-down, turn off Plane 2 by clicking the light bulb adjacent to Plane 2, and then click then click the Current: drop-down again to retract the drop-down.

The Section Plane should have disappeared and the project model should be in full view.

Now let's link our Section Plane together to form one section view.

14. On the Sectioning Tools tab, on the Planes Setting panel, click the small dialog launcher icon ([see Figure 5.20](#)).

FIGURE 5.19

Section Planes can be linked to form one section view 15. In the Link Section Planes Settings dialog click Link Section Planes, Plane Alignment 1, and Plane Alignment 2.

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The Section View should now be a combination of Plane 1 and Plane 2. The drop-downs in the Section Plane Settings dialog for the various Section Planes can be adjusted to associate different views (i.e. Front, Bottom, etc.) with a Section Plane. We encourage you to explore more by trying other combinations before continuing.

Now let's look at the Section Box feature.

Remain in the "Section Plane Settings" dialog; if you closed it, please reopen it now.

16. Deselect all checkboxes that are currently checked, also uncheck the Link Section Planes checkbox and then click OK.

17. In the Scene View, on the ViewCube, click the Home icon.

The project model should be in full view now.

18. On the Sectioning Tool contextual tab, on the Mode panel, click the Planes drop-down and then choose: Box.

By default, when the Section Box is enabled the Move Gizmo automatically appears and is ready for use unless a different Gizmo had been selected on the Transform panel before the Section Box was activated.

19. Hover over any axis of the Gizmo until the hand icon is displayed and then click and drag the Gizmo to move the Section Box in the desired direction.

Note the behavior and movement of the Section Box.

TIP: You can move the entire Section Box by simply hovering over the Section Box, left-click and hold down on the left mouse button, and move the Section Box anywhere in the Scene View.

The Rotate and Scale gizmos work similarly. Try them now. On the Transform panel click either Rotate or

Scale. Hover the mouse over the small shaded plane between two axes and drag. The section box will scale or rotate along that plane. Using different planes gives you control in all three directions.

20. On the Sectioning Tools contextual tab, click the Transform drop down box (see Figure 5.21).

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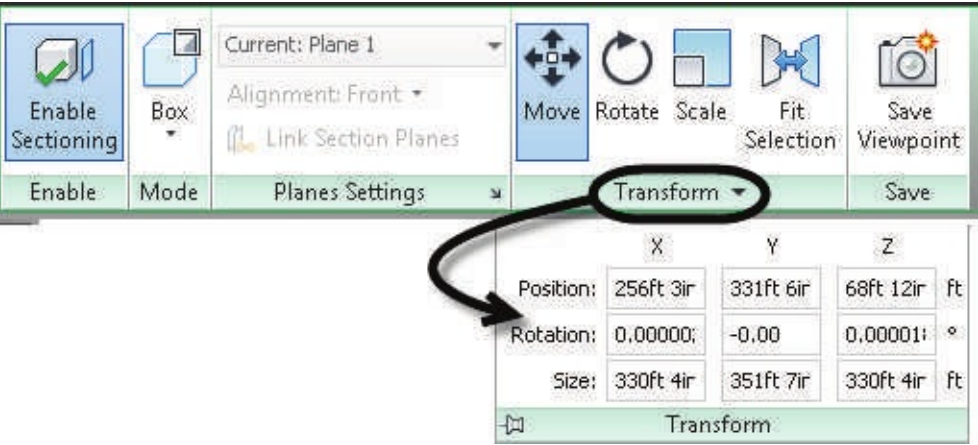


FIGURE 5.20

The Transform panel can be used to adjust Section Plane or Section Box settings 21. In the Transform drop-down, change the X Rotation to: **45.0** and note the behavior of the Section Box.

Take note of the units displayed next to each of the three transforms: Position, Rotation and Size, and try some different values in each one.

TIP: Before modifying numeric values in the Transform dialog, it is recommended that you write down the existing values or create a Viewpoint so you can reset the values if necessary.

Final y, as you are creating different section views if you arrive at one you would like to keep, you can click Save Viewpoint to save it. You can even use these Saved Viewpoints to create an Animation, as you learned above. For example, by saving a horizontal section plane near the base of the project model and animating it to a non-sectioned viewpoint, you can animate the model evolving from the ground up.

22. On the Sectioning Tools contextual tab, click the highlighted Enable Sectioning button to disable it.

The project model should be in full view now.

At the beginning of this chapter we set out to briefly discuss a few of the navigation tools in Navisworks. We reviewed changing the Background in Navisworks to potentially fit the project needs, creating Viewpoints and from those Viewpoints creating Animations, navigating through the project model to determine collisions between a building occupant and building components, and finally, sectioning the project model. Armed with this basic knowledge of the Navisworks navigation tools, we are now ready to begin exploring Navisworks further.

PREPARE TO CLOSE YOUR PROJECT FILE

If you would like to save the file you were working on herein to return to it later, you can save the project file as another name. To do so, open the Application Menu and choose: Save As. Otherwise you can close the project file without saving.

1. From the Application Menu, choose: Exit Navisworks.
2. Click No when prompted to save the changes to the project file.

QUICK REFERENCE FOR THE COLLISION DIALOG

The collision dialog contains several customizable settings. We explored a few in the tutorial above. Here is a complete list for your ongoing reference.

Collision dialog settings:

Collision—Select this option to define a volume or mass to the Viewer that will be used to identify collisions in the project model when the Walk or Fly tool has been activated. This will prevent the mass from passing through certain objects or lines in the Scene View.

Gravity—Select this option to provide “weight” to the Viewer when the Walk tool has been activated. This option works in conjunction with Collision.

Auto Crouch—Select this option to enable the Viewer to crouch under objects in the model that are normally too low to pass under when the Walk tool has been activated. This option works in conjunction with Collision.

Viewer—An invisible volume located in front of the camera in the Scene View.

Radius—Define the radius of the Viewer volume that will be used to detect collisions in the Navisworks model.

Height—Define the height of the Viewer volume that will be used to detect collisions in the Navisworks model.

Eye Offset—Define the distance below the top of the Viewer volume (Height) where the Viewer will

focus if Auto Zoom is selected.

Third Person—When enabled, an avatar will be used to represent a building occupant in lieu of the Viewer. This avatar can also help identify collisions with building components.

Enable—Select this option to use the Third person view. When an Avatar has been selected from the drop-down, it will be shown in the Scene View to represent the Viewer.

Auto Zoom—Select this option to automatically switch from the Third Person view to the Viewer whenever the Third Person view becomes obstructed by an object.

Avatar—Use the drop-down to select the Avatar that will be used in the Third Person view and applied to the Scene View.

Angle—Specify the camera angle of the camera looking at the avatar. For example, 0° will place the camera directly behind the Avatar while 15° will be the camera looking down on the avatar at a 15° angle.

Distance—Define the distance between the camera and the avatar.

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SUMMARY

Navigation through the Navisworks model is one of the most basic and critical skills you will need to master. In this chapter we have seen: The Background color and mode can be changed to suit your personal preferences.

Change the background to an appropriate backdrop when creating Viewpoints or Animations that will be shared with the project stakeholders.

Viewpoints are like saved snapshots of a location and vantage point in the model.

Navisworks can interpolate between two or more viewpoints to create a smooth animation.

Viewpoints and Animations can be exported to all the project stakeholders to help convey important aspects of the project model.

Collision Settings can be used to help identify potential conflicts between building components and building occupants.

Reference Views can be used to quickly move from one part of the project model to another part of the project model either in a Plan View or a Section View.

Sectioning can be used to cut away part of the model and can show the details within the project model.

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Section III

Project Model Analysis

WHAT’S IN THIS SECTION?

Navisworks allows you to analyze your project model from several different aspects. Clashes can be identified before they are discovered at the project site. The project model can be used to determine the spatial relationship between items and can be used to help determine conflicts between the building components as the building is being constructed. Finally, building component quantities can be determined from the project model. Please note that not all the tools discussed in this Section will apply to all three Navisworks products.

SECTION III IS ORGANIZED AS FOLLOWS:

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Chapter 6 Navisworks Object Management

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Chapter 7 Navisworks Clash Detective

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Chapter 8 Navisworks Measure and Redline

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Chapter 9 Navisworks TimeLiner

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Chapter 10 Navisworks Quantification



Chapter 6

Object Management

INTRODUCTION

Up to this point, we have learned about Navisworks settings, managing Navisworks files, and navigating through the Navisworks model. Before we can successfully use some of the other tools in Navisworks we need to gain an understanding on how to manage objects in Navisworks. This chapter is designed to acquaint you with object management tools that can be helpful when you are looking for building component clashes in your project model, rendering a project model for a presentation, or applying a colored appearance to similar objects in the project model. Object management tools can help manage one object, several objects, or a group of objects. The overall goal of this chapter is to help you better understand the object management tools available in Navisworks so you can manage the objects in your project model more efficiently and effectively. Many of the lessons that follow are descriptive and some are tutorial based. For the descriptive lessons, please feel free to follow along in your Navisworks product as you read along.

OBJECTIVES

To quickly acquaint you with the Navisworks object management tools that help can help you manage the objects in your project model. Topics we will explore include:

- Selection tools to select objects in Navisworks.

- Use similar criteria to select items.
- Create, save, and understand Selection Sets.
- Hide, Unhide, or adjust the Transparency of an item(s) in the Scene View.
- Override graphical appearances of items in the project model.

OBJECT MANAGEMENT TOOLS

As you are reviewing your Navisworks project model you have the ability to select an object, or multiple objects, through the Select tool or Select Box. However, how do you select all similar objects having the same characteristic(s) in the project model without having to **134** | Chapter 6

navigate to each object to select it? Object management tools can help you accomplish this.

These tools can help you quickly find objects based on the object's name, data associated with the object, etc. You will just need to identify the common aspect of the objects in order to help you locate all the similar objects in the project model.

OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for instructions.

1. Launch your Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

3. In the Open dialog, browse to the location where you installed the dataset files.

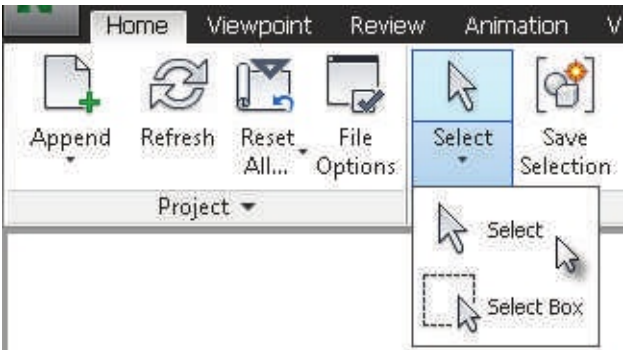
4. In the *Chapter06* folder, select the *06 Overall.nwf* file and then click Open.

Note: Use the Files of type: drop-down in the Open dialog to either display all the Navisworks files in a folder or isolate particular types of Navisworks files, in this case NWF files.

5. Above the ViewCube, click the home icon.

You should now be looking towards the front of the building. Your project model should consist of architectural, structural, and mechanical building components. The project site is not included in this file.

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SELECT TOOLS

There are two selection tools on the ribbon, the Select tool and the Select Box tool (see [Figure 6.2](#)).

FIGURE 6.1

The Select or Select Box tools allow you to select objects onscreen The Select tool allows you to select objects in the Scene View with the click of the mouse.

Once a single object is selected, if the Properties window is active, the data associated with the object is displayed there. The object is also highlighted in the Selection Tree, if it is active, and the object will be displayed in the Selection Inspector, if it is active. When the Select tool is active, the CTRL key can be used in conjunction with the Select tool to add objects to the selection. Use the ALT key in conjunction with the Select tool to deselect all other items in a selection except the one you click. For example, a window, door, and roof have been selected and it is no longer desired to have the door and window included in the selection. Simply hold down on the ALT key and click the roof and the door and window are excluded from the selection.

The Select Box tool allows you to select multiple objects using a boxed area around the objects you desire. Once multiple objects are selected the total number of items selected will be displayed in the Properties window, the objects will also be highlighted in the Selection Tree, and the objects will also be displayed in the Selection Inspector. Be sure that each of these windows is open to see this behavior. The Select and Select Box tools are straight-forward to use. You are encouraged to experiment with these tools before continuing.

Once an object(s) has been selected, other objects that have the same property information can be selected using the Select Same tool ([see Figure 6.3](#)).

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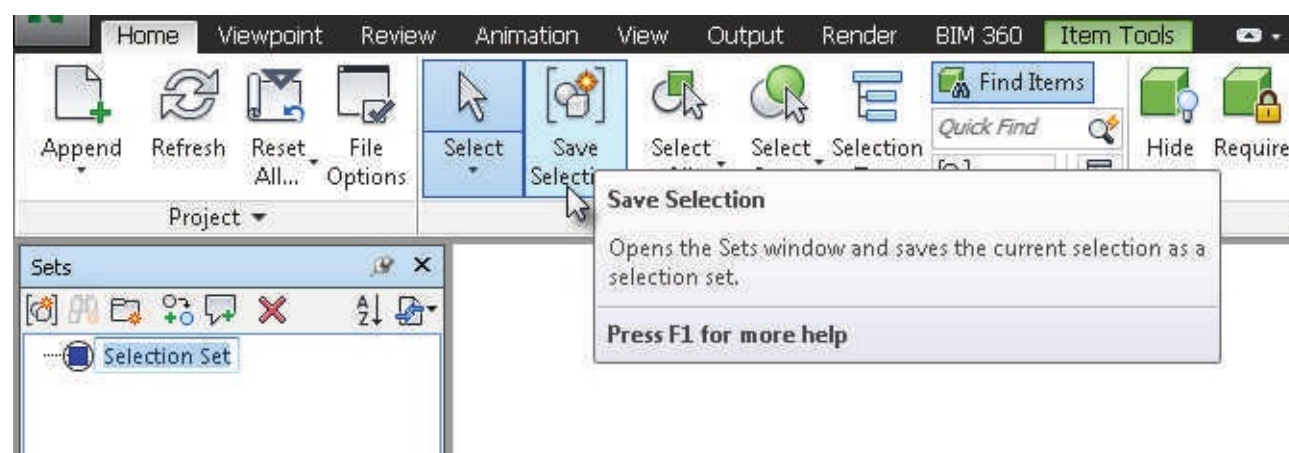
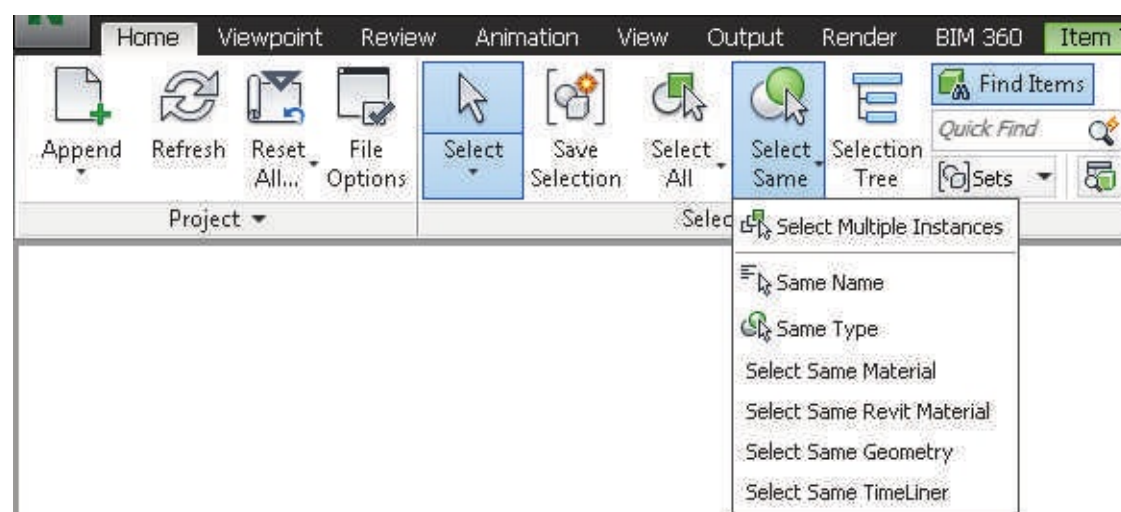


FIGURE 6.2

The Select Same tool allows objects to be selected based on similar property information For example, if a window was selected in the project model the Select Same tool could be used to select all objects in the project model with the Same Name, the Same Type of window, the Same Material, etc. The Select Same tool is a handy tool to select similar objects without have to navigate through the project model to select those items manually one at a time.

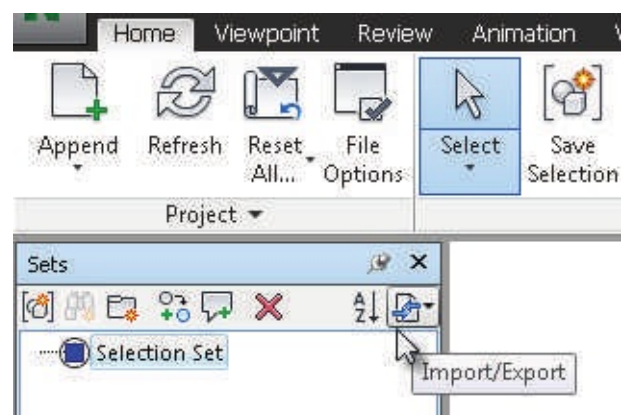
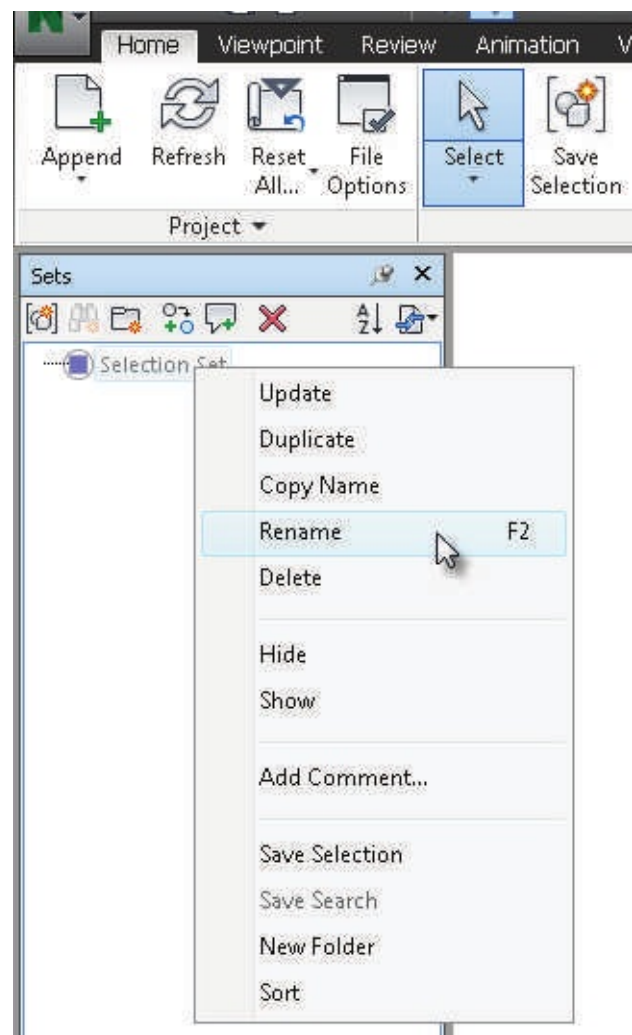
When using the Select Multiple Instances, of the Select Same tool, all instances of the selected geometry group will be selected throughout the project model.

Note: The Select Same tool works through a comparison of the objects properties. All objects with properties matching the selected object(s) of the currently selected item(s) in the Scene View will be selected.

Once an object(s) has been selected, the selected item(s) can be saved as a Selection Set through the Save Selection tool ([see Figure 6.4](#)).

FIGURE 6.3

The Save Selection tool allows the selected objects to be saved to a Selection Set Creating a Selection Set allows you to group objects together to be used later, perhaps when searching for clashes between objects. (We will discuss the Clash Detective tool in a later • Section III •



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chapter). The Selection Set can be given a name that corresponds to the selection like Window, Doors, Ductwork, Beams, etc. Selection Sets can also be grouped together in Folders and their visibility can be controlled as well. To Rename, Delete, Show, Hide, etc., the Selection Set, simply highlight the Selection Set in the Set window and right-click (see [Figure 6.5](#)).

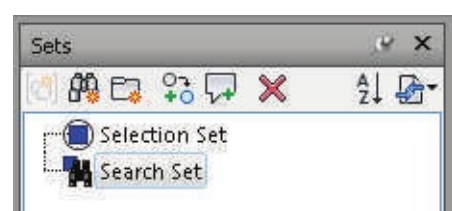
FIGURE 6.4

Selection Sets can be grouped together and visibility can also be control ed Once a Selection Set has been created, it can be exported to a XML file. Saved selection sets can be imported into other projects.

Assuming that the same object(s) and/or the same standards have been met in the other project, this can be useful. The Import/Export tool can be found in the upper right hand corner of the Sets window (see [Figure 6.6](#)).

FIGURE 6.5

Selection Sets can be imported and exported from projects There are two types of Sets and the difference between the two is critical to your success when using Sets in Navisworks. The first is called a “Selection Set” and is represented by the • Project Model Analysis •



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solid blue square circumscribed by a circle (see the first in the list shown in [Figure 6.7](#)). The other type of set is a “Search Set” and it is represented by a small blue square atop a pair of binoculars (see the second item in the list shown in [Figure 6.7](#)).

FIGURE 6.6

The Sets window shows Selection Sets and Search Sets The most important difference between the two sets is that Selection Sets are static and Search Sets are dynamic.

A Selection Set is useful when you need to save a group of objects on which you will perform a regular task. For example, hiding the objects or changing their transparency so you can see through them. This is a group of items stored for later (and frequent) retrieval. If the project model changes or is updated, these items will still be included in the Selection Set, (assuming that they still exist in the project model), when the Selection Set is recalled.

Note: Selected objects can be dragged from the Scene View and placed in the Sets window in order to create a new Selection Set.

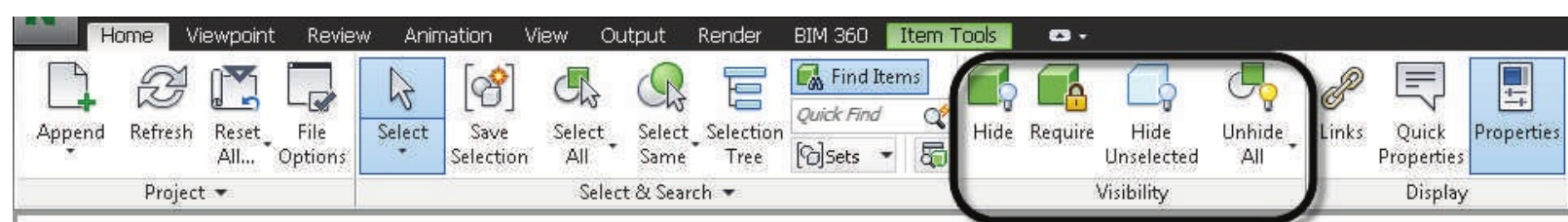
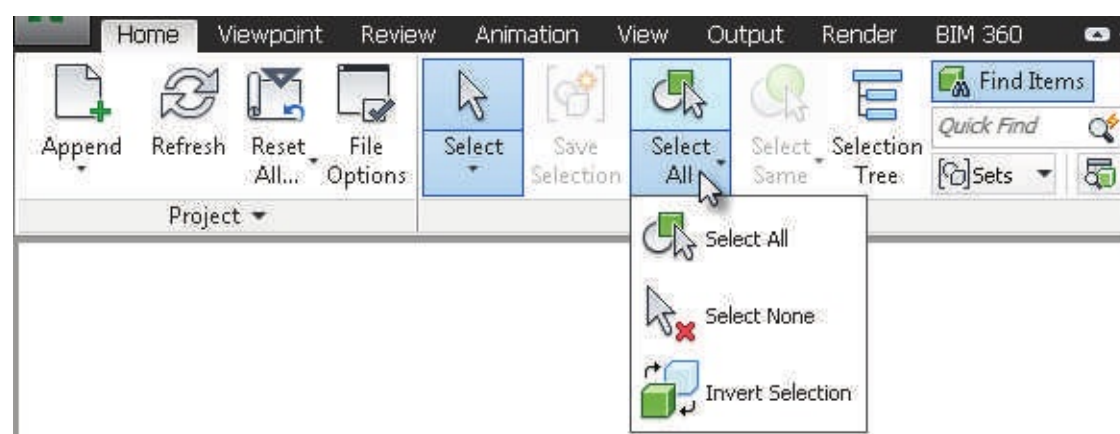
A Search Set is similar to a Selection Set with the exception that the Search Set saves search

criteria instead of the results of a selection. This allows you to rerun a Search Set at any time.

This is extremely helpful when the Navisworks project model is updated. Since a Search Set is based on search criteria, the Search Set will always add and/or subtract items automatically, after the Search Set is updated. For example, a Search Set was created for doors in the project model. The Search Set contains 10 doors. During a model update two more doors are added to the model. When the Search Set is updated it will yield 12 doors; so long as the search criteria of the 12 doors did not change. We will learn more about Selection Sets and Search Sets later in this chapter.

Another very useful selection tool is the Select All tool (see [Figure 6.8](#)).

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FIGURE 6.7

The Select All has some useful overall selection options The Select All tool allows you to select all visible objects in the Scene View, deselect all selected objects, or invert the selection. When a selection is inverted the selected objects are deselected and in their place all of the previously non-selected objects become selected.

Sets are very useful when performing many tasks in Navisworks. As you use Navisworks more, you will begin to see the power of sets. One very useful way to use sets for example is to control visibility.

VISIBILITY

As you are reviewing, or navigating through, the project model you might want to hide objects or make them more transparent so you can see things more clearly. Let's review some of the Visibility tools that will allow us to do this.

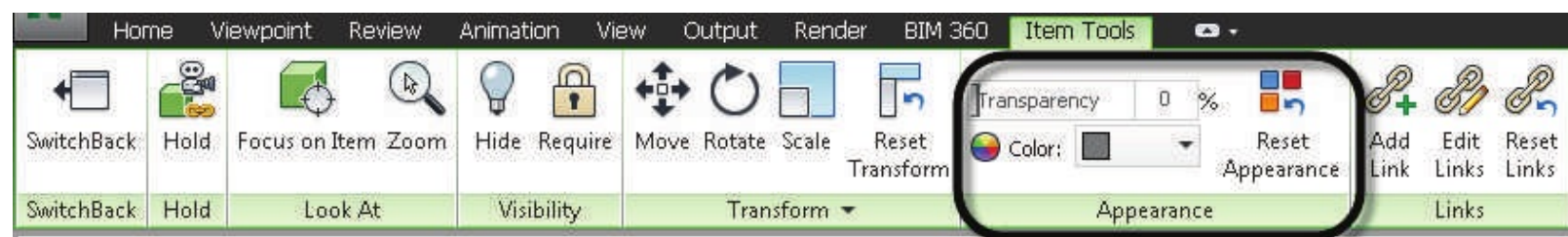
When the Home tab is active, and an object(s) is selected, all the tools on the Visibility panel become active (see Figure 6.9). Conversely, when no objects are selected, three of the four tools: Hide, Require, and Hide Unselected, are not active (grayed out) and only the Unhide All tool is available (active).

FIGURE 6.8

Visibility tools on the Home tab are available once an item is selected From the Visibility panel you have the following options once an object(s) is selected.

Hide:—Use this tool to hide the objects in the current selection so they are not visible, or drawn, in the Scene View.

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Require:—Use this tool to require objects to be rendered as you are navigating through the project model. As you navigate through the project model Navisworks will drop out certain geometry in an effort to maintain the established frame rate. Autodesk defines drop out in the Navisworks product as:

“In order to maintain interactivity and guarantee a user-defined frame rate, Autodesk Navisworks only renders what it can in the fraction of a second that it has. The remainder is “dropped out”, or not rendered.

Autodesk Navisworks prioritizes what is rendered and what is dropped out based on size of the item’s bounding box, distance from viewer and size on screen, so only the less significant items in the scene are dropped out.”

Hide Unselected:—Use this tool to hide the objects that are not in the current selection so they are not visible, or drawn, in the Scene View.

Unhide All:—Use this split button tool to either select Unhide All or chose from other available options.

Unhide All—Use this tool to reveal all hidden objects previously hidden.

Unrequire All—Use this tool to return all required objects to a non-required state which might allow those objects to be dropped out when navigating through the model.

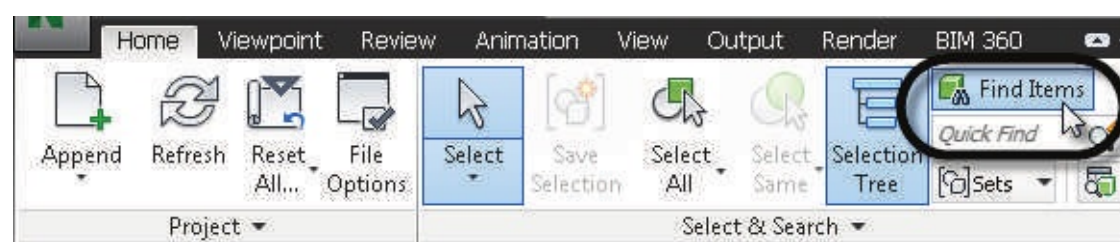
Note: When an object is hidden the object will appear gray in the Selection Tree.

Feel free to experiment with selections and the visibility tools. Try using either the Select or Select Box tools to make a selection set and then try Hide. Take note of how the object displays on the Selection Tree when you do this. If you deselect the object before unhiding it, use the Unhide All button to restore it.

Once an object is selected, the Item Tools contextual tab becomes available. There you will find the Hide and Require Visibility tools again as well as the Transparency tool ([see Figure 6.10](#)).

FIGURE 6.9

The Transparency and color of an object can be adjusted on the Item Tools tab • Section III •



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With an object(s) selected the Transparency of the object(s) can be adjusted either by the Transparency slider or through numerical input. To enter the transparency numerical y, click in the percentage field next to the slider and type in the percent of transparency desired. As the Transparency slider bar is adjusted the numerical percentage of transparency is noted.

When the numerical value of transparency is entered the Transparency slider bar moves to the appropriate location.

You can also change the color of the object with the Color drop-down. Final y, if either the Transparency or the color of an object has been modified, use the Reset Appearance tool to restore their original state through.

Feel free to experiment with either the color or transparency tools at this point. If you do experiment with either of those tools don't forget to use the Reset Appearance tool to change the object(s) back to their original state when you are finished. A quick way to do this is to use the Select All tool to select all objects and then click the Reset Appearance tool. This way you are assured that you did not miss any objects.

FIND ITEMS

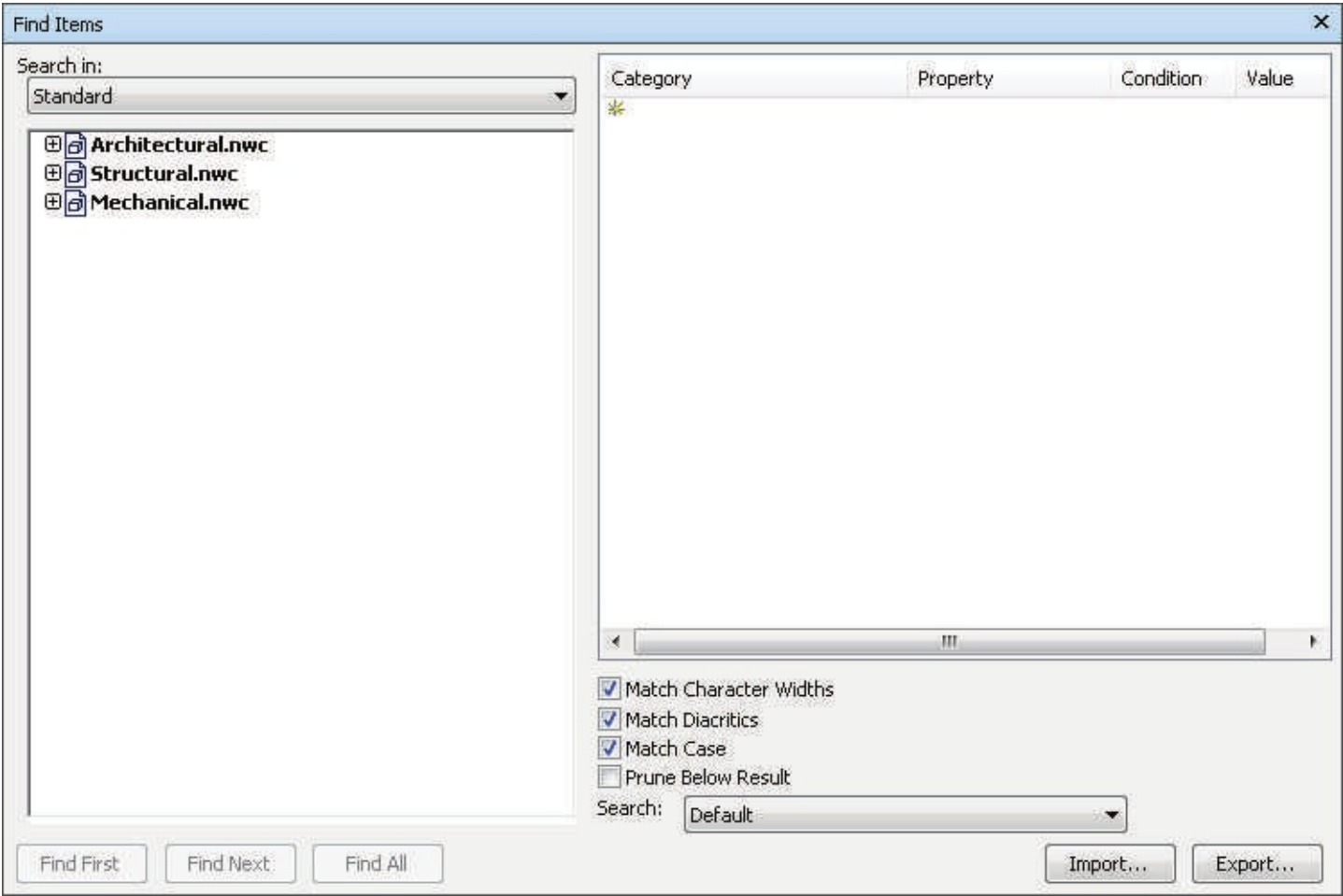
In this topic we'll expand our knowledge of selection set features discussed above with a look at the Find Items window. The Find Items window is a dockable window that allows you to search for items that have similar criteria or data associated with them. For example, to find a particular sized door in a project model you would use the Find Items window. The first step is to open the Find Items window.

1. On the Home tab, on the Select & Search panel, click Find Items ([see Figure 6.11](#)).

FIGURE 6.10

Open the Find Items window

The Find Items window will open as a floating window, but you can dock it to the edge of the screen like other windows. The left pane of the Find Items window displays the Find Selection Tree. At the top of the Find Selection Tree is a drop-down that identifies the level • Project Model Analysis •



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of item where the search should begin (see [Figure 6.12](#)). This can be a file, an instance, etc.

These options are similar to the options in the Selection Tree: Standard—This displays trees hierarchy which includes all instances and the composition of each component.

Compact—This will displays a simplified format of the tree standardizing items into either layers or levels.

Properties—This displays the trees hierarchy based on the properties of item’s in the model.

Set—This displays a list of selection and search sets in the project model.

FIGURE 6.11

The Find Items window as it appears when undocked Note: The list of Sets shown in the tree is the same as in the Sets window or in the Sets drop-down found in the Select & Search panel on the Home tab.

The right pane allows you to define search statements when searching for the items. A search statement contains a Category, a Property of the Category, a Condition (not equals, contains, etc.) and a Value. For example, you can search for any Item whose Name contains “duct”.

TIP: Search statements that are preceded by an asterisk * indicates that a default setting, like Match Case has been selected to be ignored.

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Once successful search statements have been created, they can be exported to an XML file.

Like selection sets discussed above, these can then be imported into another project that uses similar object composition. The Import/Export tool can be found in the lower right hand corner of the Find Items window.

Let’s give the Find Items window a try by creating a Search Set for ductwork and structural beams.

2. Dock the Find Items window at the bottom of your screen.

To learn more about Dockable Windows please refer to the [“Dockable Windows and the Docking Tool”](#) topic in [Chapter 2](#).

Since the structure and ductwork are obscured by the architectural components of the project model, let’s first hide the architectural components.

TIP: Hidden items are NOT included in searches.

Make sure that you have the Selection Tree and Properties windows open and pinned. If they are not, on the Home tab, on the Select & Search panel, click the Selection Tree button and on the Display panel, click the Properties button to open them. . Pin both windows.

3. In the Selection Tree select Architectural, right-click and choose: Hide.

4. In the Scene View, above the ViewCube, click the Home icon.

5. Select any steel beam in the project (not a column or a webbed joist).

Once you have selected a steel beam the selection is highlighted in the Selection Tree and item information is also displayed in the Properties window. An icon will also appear next to each item in the tree. In the case of the beams in this model, they show using a composite object icon which is indented beneath an instanced group icon. In this case, the family in the original Revit model is the instanced element while the Revit type is seen as a composite object. To learn more about the different Selection Tree icons please refer search for “selection tree icons” in the Navisworks help.

W18X40 should currently be highlighted in the Selection Tree.

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6. In the Properties window, review the information contained on the various tabs.

When attempting to select a group of similar items, you are looking for that one characteristic the will separate the items you are looking for from other items. Unfortunately, geometry information might not contain a unique differentiator and you will be forced to go back to the Selection Tree and move up one level from the Item of Geometry to the an Instance Group.

7. In the Selection Tree, click the Instance Group (W-Wide Flange1) directly above the above the selected item.

Note that the item selected in the Scene View does not change. However, there is different property information available in the Properties window.

8. In the Properties window, review the information contained on the various tabs.

Now that there is more detailed information available we can identify a unique differentiator to help us select a group of items.

9. In the Properties window, click the Item tab.

Note that the Type value begins with: “Structural Framing.”

Let’s use the word “framing” as our unique characteristic to create a new Search Set for the structural framing in project.

10. In the right pane of the Find Items window, place the cursor between each heading (i.e.

Category and Property, Property and Condition, etc.) and expand the width of each column so the drop-downs in each column can be viewed better.

11. In the Category column, click the drop-down and then choose: Item.

12. In the Property column, click the drop-down and then choose: Type.

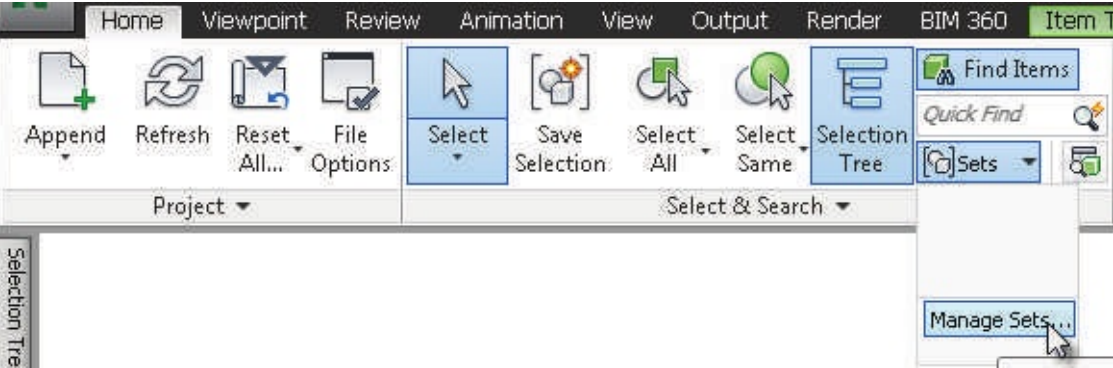
13. In the Condition column, click the drop-down and then choose: Contains.

14. In the Value column, type: **framing** (all lower case) and then press ENTER

([see Figure 6.13](#)).

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Category	Property	Condition	Value
Item	Type	Contains	framing
<div> <div>Item</div> <div></div> </div>			



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FIGURE 6.12

Search for items that match a specific criterion in the Find Items window Based on the criteria entered in the Find Items window, we will be searching for items that contain “framing” as part of their Type value. In this case, since framing was entered as al lower case the search wil not include the item that we have currently selected since the cases do not match. In addition, we real y want to include al framing in the search so the criteria should not be limited to match the case.

15. Below the right pane in the Find Items window, uncheck Match Case.

Note that the asterisk has now appeared in front of the search criteria. As previously mentioned above, this indicates that a default setting will be ignored.

16. Below the left pane in the Find Items window, click Find All.

You should notice several things that happened. First, the Scene View highlights all items that match the search criteria. The Selection Tree shows all items matching the search criteria highlighted as well and finally, the Properties windows reflects the total number of items selected. Notice that none of the columns were selected because the Type value of the column did not match the Type value of the selection criteria. Now let’s create a Search Set.

17. On the Home tab, on the Select & Search panel, click the Sets drop-down and then choose: Manage Sets ([see Figure 6.14](#)).

FIGURE 6.13

Selection and Search Sets can be managed in the Sets window This will open the Sets window, or if it is open already, shift focus to it. If it is not pinned open, pin it now to keep it open.

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18. In the Sets window, click the Save Search icon.

19. In the Sets window, select Search Set, right-click and choose: Rename. Type: **Framing** for the new name and then press ENTER.

A new Search Set has been created for all items that contain the Item Type value of “framing.” Now, let’s create a new Search Set for ductwork. Since we know that the structural model should not contain any ductwork items let’s hide the structural model through the Selection Tree. First, we will need to clear our current selection.

20. Click anywhere in any empty space in the Scene View (but do not click on an item).

21. In the Selection Tree select Structural, right-click and choose: Hide.

22. In the Scene View, above the ViewCube, click the Home icon.

Since we successfully created a selection criteria for framing let’s use the same selection criteria to locate all the ductwork in the project model.

23. In the Value column, type: **duct** (all lower case) and then press ENTER.

24. Below the left pane in the Find Items window, click the Find All button.

You should notice that all items containing ductwork as part of the Type value have been highlighted in the Selection Tree, the Scene View, and denoted in the Properties window.

Let’s create a Search Set for ductwork now.

25. In the Sets window, click the Save Search icon.

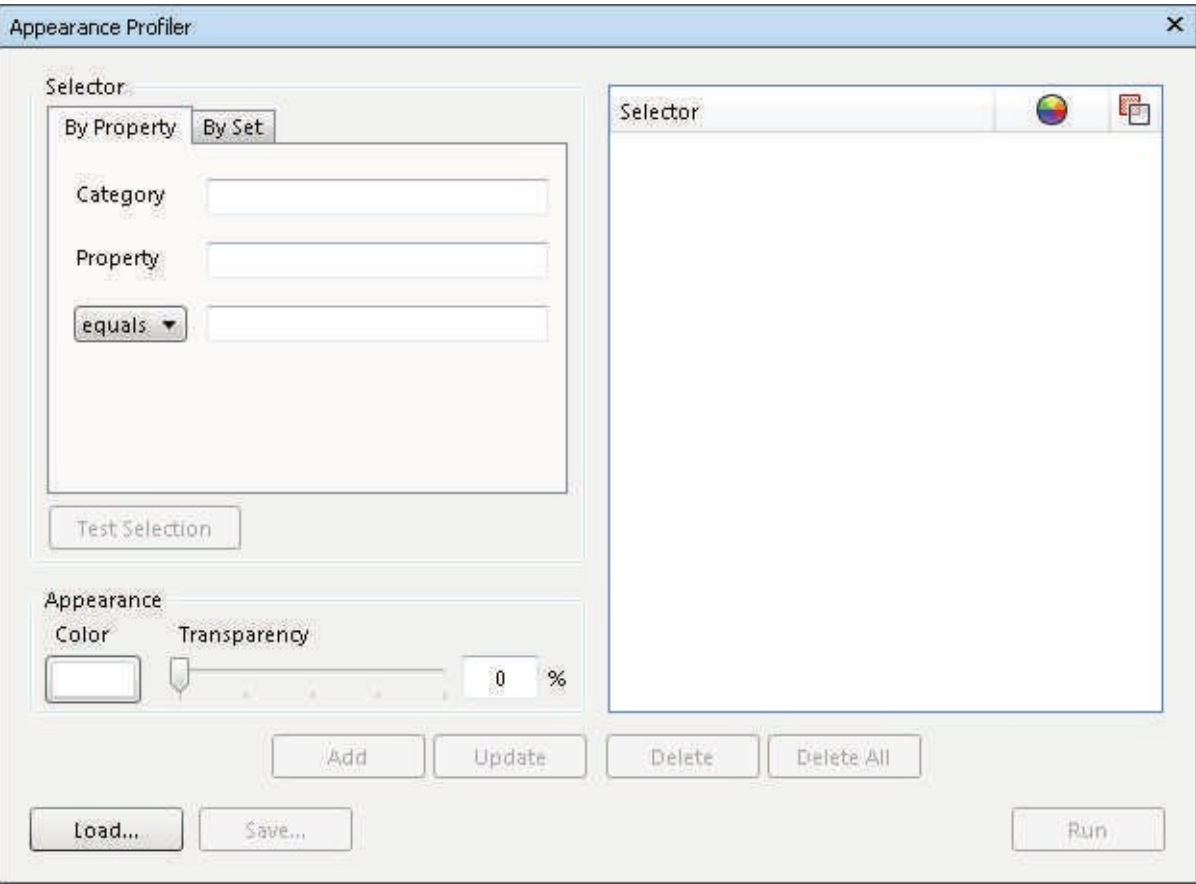
26. In the Sets window, right-click Search Set, and choose: Rename, type **Ductwork** and then press ENTER.

27. Click anywhere in empty space in the Scene View to deselect everything.

28. Close the Find Items and Sets windows.

A new Search Set has been created for all items that contain the Item Type value of ductwork. Search Sets can be used in the Clash Detective tool and for other purposes as well.

For example, they can be used in the object management tool called: Appearance Profiler.



APPEARANCE PROFILER

The Appearance Profiler tool allows you to assign colored appearances to Selection or Search Sets or to items based on property values associated with the item. The application of color to an item is called a Selector. The same concepts that you learned above in the Find Items topic discussion, finding unique characteristics of items, can be applied in the Appearance Profiler tool to define Selectors. The order of Selectors within the Appearance Profiler is important as the Selectors are applied sequentially from top to bottom in the Selector pane.

Let’s use once of the Search Sets that we just created to create a new Selector and then let’s use the concepts from the Find Items topic discussion to create a new Selector for our project model.

- 1. On the Home tab, on the Tools panel, click Appearance Profiler.

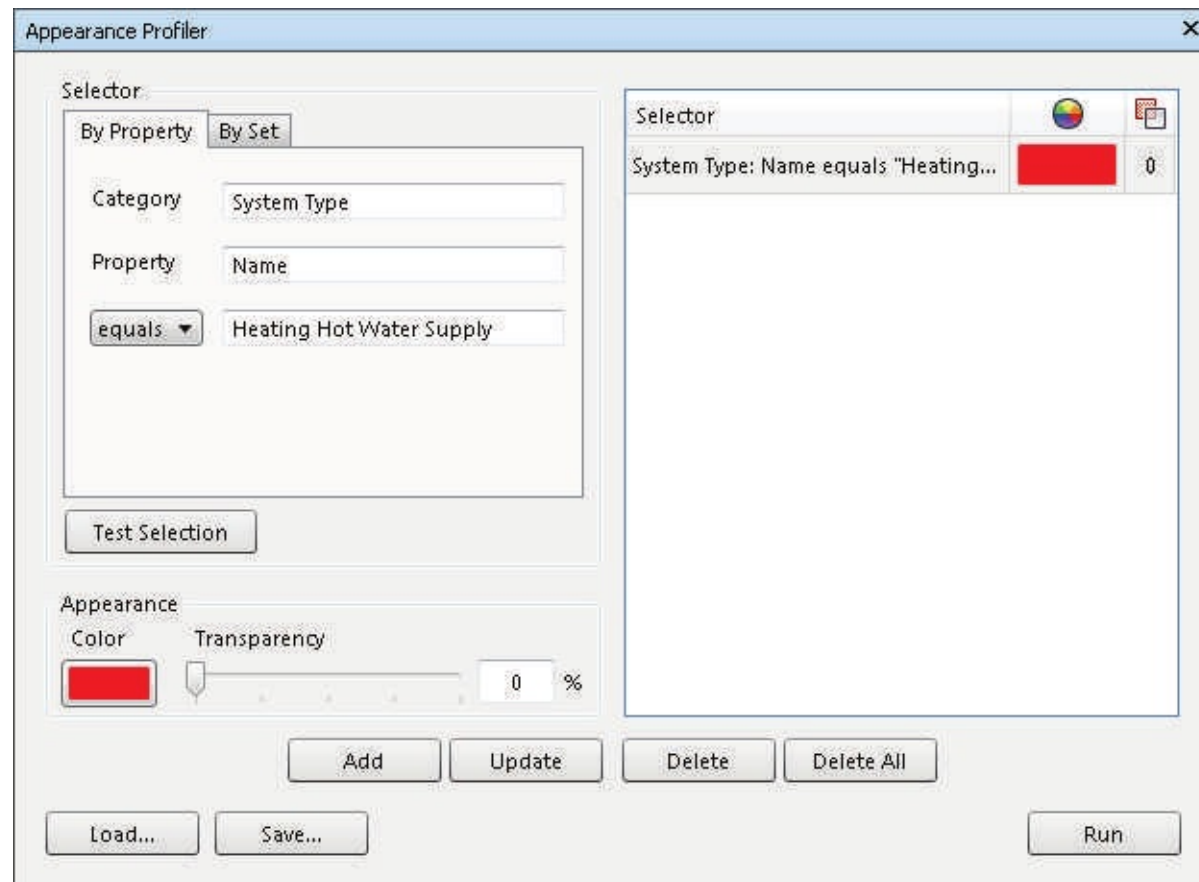
The Appearance Profiler dialog will display as a floating window initially. You can dock the dialog like other windows or if you would like or leave it floating ([see Figure 6.15](#)).

FIGURE 6.14

The Appearance Profiler dialog

In the [“Find Items”](#) topic above, we selected an item and reviewed its Property data in the Properties window. We used the Selection tree to review more data associated with the selected item. We will use this approach and apply it in the Appearance Profiler to create a Selector for the Heating Hot Water Supply pipe in the project model. Before we enter values in the Appearance Profiler you can select a pipe and look at the Instance Group properties in the Property window to confirm the values that we will use.

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2. In the Selector area, on the By Property tab, for the Category value input: **System Name**.
3. For the Property value input: **Name**.
4. Next to the equals drop-down, input: **Heating Hot Water Supply** (case sensitive).
5. Click the Test Selection button.

At this point all of the pipe in the project model matching the values entered should be selected and the total number of items selected should be displayed in the Properties window.

6. Click on the Color swatch icon and then in the “Color” dialog select the color red and then click OK.
7. Click the Add button to add the selection to the Selector list ([see Figure 6.16](#)).

FIGURE 6.15

The Appearance Profiler containing a Selector in the Selector list 8. Close the Appearance Profiler dialog.

You should note that the pipe in the project model does not have any color applied to it.

Although a Selector was created and an override color was applied to the Selector we did not apply it to the project model. Let's apply the Selector to the project model now.

9. On the Home tab, on the Tools panel, click Appearance Profiler.

10. Click the Run button.

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You should note that all the pipe in the project model matching the selection criteria of Heating Hot Water Supply now has the color red applied to it. Since we previously created Search Sets let's use a Search Set in the Appearance Profiler to create a new Selector.

11. Close the Appearance Profiler dialog.

12. On the Home tab, on the Tools panel, click Appearance Profiler.

13. In the Selector area, click the By Set tab.

14. In the Set pane, click Ductwork and then click Test Selection.

15. Click the Color swatch icon and in the "Color" dialog select blue and then click OK.

16. Click the Add button to add the selection to the Selector list.

17. Click the Run button and then close the Appearance Profiler dialog.

18. Click in an empty area in the Scene View to clear the selection.

You should note that all the ductwork that was contained in the Search Set now has the color blue applied to it. At this point you are encouraged to experiment further in the Appearance Profiler dialog. Try deleting Selectors or adding new ones, changing the Color of the Selectors and Update the Selectors for which you changed the criteria. You can even Save the Selectors, Delete All, and Load the Selectors again from the file you just saved. Once you are finished experimenting, please make sure that at least one Selector has been applied to the project model as we are going to learn how to remove Appearances from the project next.

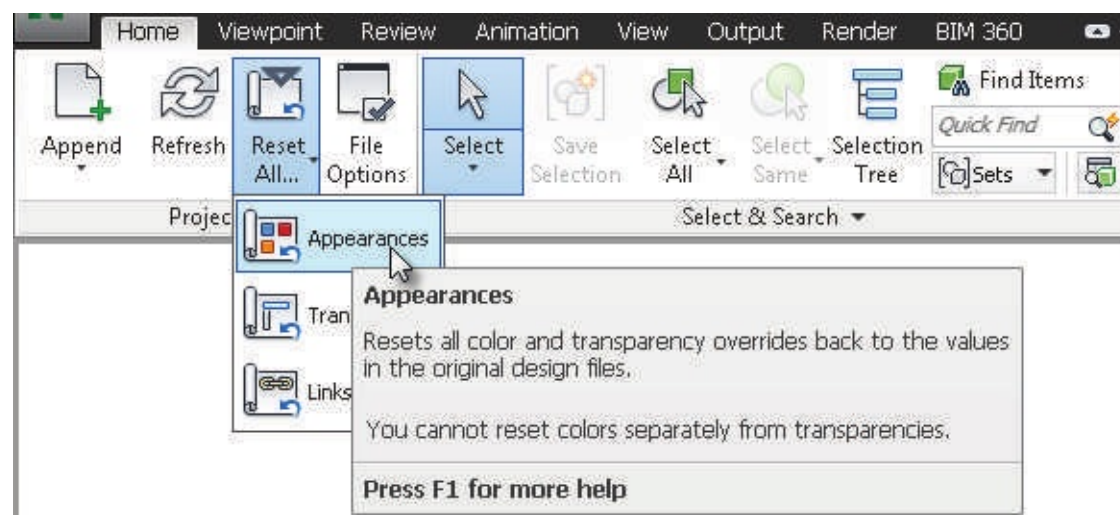
REMOVE AN APPEARANCE

At this point you should have at least one Selector applied to the project model. Let's look at how we can

remove an Appearance from the project model.

19. On the Home tab, on the Project panel, click the Rest All drop-down and then click Appearances (see [Figure 6.17](#)).

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FIGURE 6.16

Once applied, Appearances can quickly be removed from the project model. All Appearance overrides in the project model have been removed now. This does not mean that the Selectors have been deleted from the Appearance Profiler. If you open the Appearance Profiler dialog again, all Selectors should still be available and if you want to reapply them again you can.

PREPARE TO CLOSE YOUR PROJECT FILE

If you would like to save your work in this chapter to return to it later, you can save the project file as another name through the Application Menu with: Save As. Otherwise let's close the project file without saving.

20. From the Application Menu, choose: Exit Navisworks.

21. When prompted to save the changes to the project file, click No.

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QUICK REFERENCE FOR THE APPEARANCE PROFILER DIALOG

The Appearance Profiler dialog has three distinct areas: the Selector area, the Appearance area, and the Selector pane showing the list of Selectors in the project model. We explored a few in the tutorial above. Here is a complete list for your ongoing reference.

Selector area—Use this area to define and test the selection criteria that will be used to create an Appearance Profile Selector. Selector criteria can be specified By Property or By Set.

By Property tab:

Category—Input the Property Category information that will be used in the search criteria (i.e. Item, Element ID, Element, etc.). The best way to remember the Property Category information is to think about the tabs in the Properties window after an item has been selected.

Properties—Input Property information that will be used in the search criteria (i.e. Name, Type, Family, Category, etc.). The best way to remember the Property Category information is to think about the data displayed in the Properties window after a specific tab has been selected.

equals/does not equal—Use the drop-down to select the specific condition of the selection criteria and enter the information that will be used in the search criteria.

Note: The value entered in equals or does not equal are case sensitive. Therefore, the value entered must exactly match the value of the data being searched.

Test Selection—After all the data has been entered on the By Property tab, click Test Selection to test the selection criteria identifying all items in the project model meeting the selection criteria.

By Set tab:

Sets pane—The list of available Search and Selection sets in the project model.

Note: Only one Selection or Search Set can be selected in the Sets pane.

Refresh—Click Refresh to update or refresh the Selection and Search Set list.

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Test Selection—After the appropriate Selection or Search set has been chosen, click Test Selection to test the selection criteria identifying all items in the project model meeting the selection criteria.

The Appearance area:

The Appearance area can be used to override the appearances of the selected items.

Color—Select the color that will be used to override the appearance of the selected items.

Transparency—Use the slider to select the Transparency level that will be applied to the selected items. A numerical value for the percentage of Transparency can also be entered into the corresponding box.

The Selector area shows a list of all the Appearance Profiler Selectors in the project model. You can Update Selectors but Selectors cannot be moved up and down in the Selector pane and the order of Selectors is applied sequentially from top to bottom in the Selector pane. To correct the order of Selectors you might need to delete Selectors.

Buttons at the bottom of the dialog:

Add—Click Add to apply the selected Color to the items matching the selection criteria.

Update—Click Update after modifying the selection criteria, or the Color of the items matching the selection criteria, of a Selector in the Selector List.

Delete—Click Delete to delete the selected Selector from the Selector list.

Delete All—Click Delete All to delete all the Selectors from the Selector list.

You will be prompted to confirm your choice this before all Selectors are deleted.

Load—Click Load to import a previously saved DAT file containing saved appearances.

Save—Click Save to export all current appearances in the Appearance Profiler to a DAT file.

Run—Click Run to sequentially apply all Selectors in the Appearance Profiler to the project model.

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SUMMARY

Object management is an important aspect of working in a Navisworks project model. You can create Selection and Search Sets, Find Items in the project model based on specific selection criteria, and override appearances of items in the project model.

The Background color can be set to suite your personal needs.

Background color can be set for an appropriate backdrop when creating Viewpoints or Animations that will be shared with the project stakeholders.

Viewpoints and Animations can be created and shared with all the project stakeholders to help convey important aspects of the project model.

Collision Settings can be used to coordinate to identify potential conflicts between building

components and building occupants.

Reference Views can be used to quickly move from one part of the project model to another part of the project model either in a Plan View or a Section View.

Sectioning can be used to create Section Views that can show the details of the project model.

Overriding Appearances of an item(s) in the project model to provide new or additional clarification to the item(s).

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Chapter 7

Clash Detective

INTRODUCTION

Now that you have some understanding of Navisworks settings, managing files, navigating through the model, and managing objects you are ready to look at one of the most powerful tools in Navisworks: the Clash Detective tool. A “clash” is the name that Navisworks uses to identify a physical conflict in the building model (i.e. when two physical objects occupy the same location). With the Clash Detective tool you can define the type of clash, the tolerance between clashes, and set-up rules for clash tests. The goal of this chapter is to help you understand how to use the Clash Detective tool to help you identify potential conflicts in the project model before they are discovered at the project site.

OBJECTIVES

To acquaint you with the Navisworks Clash Detective tool that allows you to identify clashes between building components in your project model. Topics we will explore include:

- Create Clash Tests.
- Understand the results of the Clash Test.
- Apply Rules to the Clash Test.
- Create Clash Test Reports to share with the project team.

USING CLASH DETECTIVE

The Clash Detective tool allows you to identify conflicts between building components in the project model. Parameters can be established to define how clashes will be determined.

Once clashes have been identified, clash reports can be generated and shared with the project team. To help us with our work, some of the concepts and object management tools that we

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learned in the last chapter will apply to the Clash Detective and can help us manage clashes between building components.

OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for instructions.

1. Launch your Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

3. In the Open dialog, browse to the location where you installed the dataset files.

4. In the *Chapter07* folder, select the *07 Overall.nwf* file and then click Open.

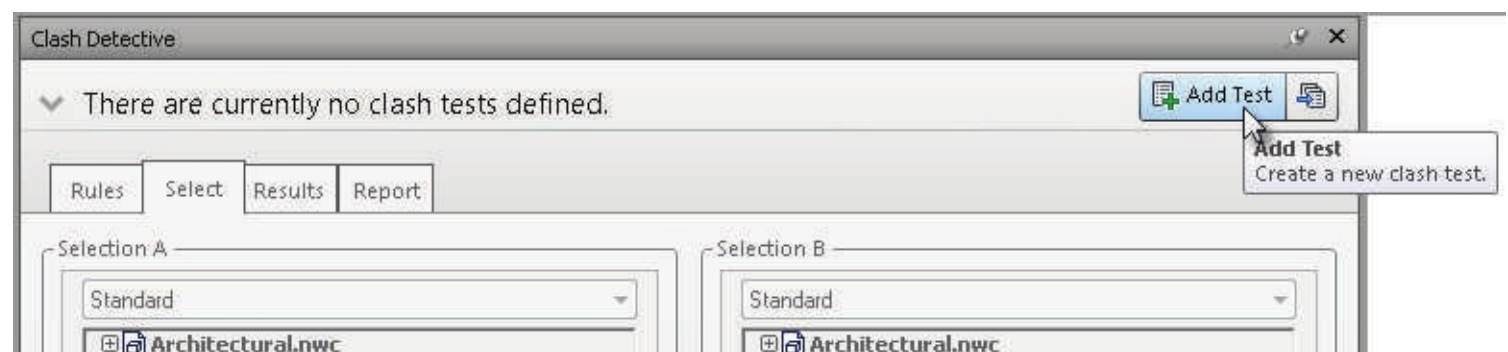
Note: Use the Files of type: drop-down in the Open dialog to either display all the Navisworks files in a folder or isolate particular types of Navisworks files, in this case NWF files.

5. Above the ViewCube, click the home icon.

You should now be looking towards the front of the building. Your project model should consist of architectural, structural, and mechanical building components. The project site is not included in this file.

Let’s review the Clash Detection tool in order to identify conflicts in our project model.

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CLASH TEST

Before you can determine what clashes exist in your project model you will need to create a Clash Test. Once a Clash Test has been created it can be named based on the type of test (i.e.

Structure vs. MEP). Individual items, a group of items, or Search and/or Selection Sets can be used in the Clash Test and a tolerance between clashes can be set to help include “soft clashes” A soft clash could be the clearance between two items like two pipes or ducts, a pipe and duct, or a pipe or duct and a structural component with fireproofing. In certain cases, items like insulation or fireproofing might not be

included in the project model but it is understood that they will exist due to the specifications of the project. If pipes and ducts have 1-1/2" of insulation around them it might be necessary to provide a 4" clearance between those items. That criterion can be part of the Clash Test. Rules can be created for the Clash Test as well. For example, a pipe that passes through the roof structure can be excluded from the results as it might be understood that any pipe passing through the roof structure could be a vent through the roof from a plumbing system. Let's create a simple Clash Test for the entire building.

If the Clash Detective tool is not already open, On the Home tab, on the Tools panel, click Clash Detective, pin the window open. Dock it to either the left or right side of your screen, and increase the size of the window such that you can clearly see all components of the window. If you have two monitors, as an alternative you can drag it to the second monitor.

1. In the Clash Detective window, click Add Test ([see Figure 7.2](#)).

FIGURE 7.1

Clash Tests must first be created before clashes are identified Once a Test has been added the Clash Test pane becomes active and the added test is displayed in the pane. In addition, several buttons become available under the clash test pane.

Add Test—Adds a new Clash Test.

Deletes All—Deletes all Clash Tests.

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Compact All—Deletes all Resolves clashes in all Clash Tests. The Resolved Clash Status will be discussed later in this chapter.

Reset All—Resets the status of all Clash Tests to New.

Update All—Updates all out-of-date Clash Tests.

Import/Export Clash Tests—Allows you to import previously saved Clash Tests or export current Clash Tests. Clash Tests are saved as XML files that can be used in other projects.

Now let's define the parameters to our Clash Test.

2. In the Selection A pane, hold down the CTRL key and then select Architectural, Structural, and Mechanical.
3. In the Selection B pane, repeat the same selection.
4. In the Settings area, from the Type drop-down choose: Hard.

Here is a brief description of each type of clash:

Hard—Two items that physically intersect.

Hard (Conservative)—Two items intersect even their geometry triangles do not.

Clearance—Two items that intersect when they come within a specified distance of each other. The distance is the value input into the Tolerance field. This clash also selects Hard clashes as well.

Duplicates—Two items that are identical in type and position.

5. In the Tolerance field, input: **3"** .

TIP: Do not press ENTER after inputting the value in the Tolerance field. If you do, the test will run and you will be switched to the Results tab. If you did not intend to run and still need to adjust settings, click back on the Select tab.

Note: Knowing how Display Units are configured in Navisworks will help you input dimensional values correctly. For example, if your Display Units are set to Feet and Fractional Inches, as they have been herein, you can simply type: **0.25** for **0'-3"** . If Display Units are set to Meters and **0ft 6** in is entered this will automatically be converted to: 0.15 m.

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Tolerance can be defined as the severity of the clash. For example, when the type setting Hard has been selected and a 3 inch tolerance has been defined this establishes a parameter that allows two items to intersect up to 3 inches and they will not be considered a clash.

Navisworks will only identify the two items as a clash if they intersect *more* than 3 inches.

Conversely, when the type setting Clearance has been selected and a 3 inch tolerance has been defined this establishes a parameter that only allows items to be *no closer* than 3 inches before they are considered a clash.

TIP: It is imperative that the correct Type setting be selected and the appropriate Tolerance value be entered in order to receive valid and useful clash test results.

6. In the Settings area, check the Composite Object Clashing checkbox.

Now that we have created a Clash Test let's test the building components against the parameters we defined in the Clash Test.

CLASH DETECTIVE RESULTS

Once a Clash Test has been created and parameters have been assigned, you can have Navisworks test all the items in the project model against that Clash Test. Let's run our Clash Test on our project model to determine the total number of clashes we have in the model that meets the parameters we assigned to the

Clash Test.

- 1. In the Clash Detective window, click the Run Test button.

In the case above, we simply created a Clash Test, selected all items in the project model, specified the type of clash and the tolerance for the clash, and then we ran the test. In this case we allowed items to intersect each other up to 3 inches before they were considered a clash. After the test was run, Navisworks determined that there were 1,321 clashes in the project model and displays the results of the Clash Test in the Results tab (see [Figure 7.3](#)).

The Results tab should automatically be displayed once the Clash Test has been performed.

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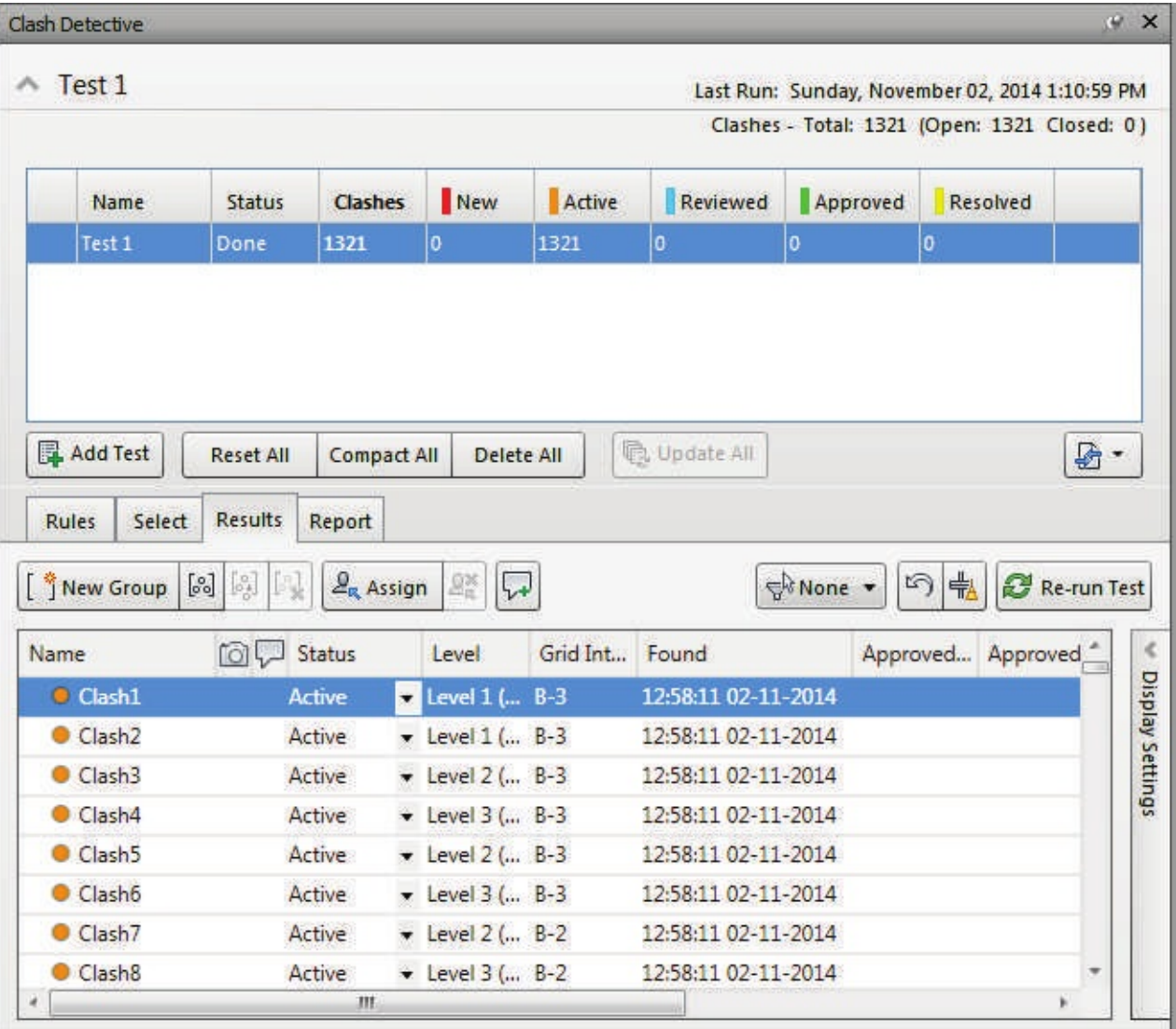


FIGURE 7.2

When you run a clash test, the results tab displays There are several actions we can take on the Results tab. Clashes that are found, based on the parameters of the test, are shown in a multi-column table in the

results area. By default, the clashes that are found are numbered by severity. The columns in the results area can be resized and the results table can be sorted by clicking on a particular column.

The results table displays a colored clash icon and the color of the icon is determined by the Clash Status. The clash icon and the clash status can be defined as follows (color first followed by description):

Red–New. A Clash found for the first time.

Orange–Active. A Clash found in a previous run of the Clash Test and has not been resolved.

Cyan–Reviewed. A clash previously found and marked as Reviewed. This could have been done through the Assign a Clash tool.

Green–Approved. A Clash previously found and marked as Approved. If the status of the clash is manually changed to Approved, the user currently logged in is recorded as the approver and this will be reflected in the Reports and in the Results window under the Approved By column. The current system time of the approval is also noted in the Results window in the Approved column. If • Section III •

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the Clash Test is run again, and the same clash is found again, the status of the clash will remain Approved.

Yellow–Resolved. A Clash found in a previous Clash Test run but not found in the current Clash Test run. Navisworks assumes that the issue has been resolved through changes in the project model and automatically updates the clash to this status. If the status of the clash is manually changed to Resolved and the Clash Test is run again and the clash is found again, the status of the Clash will automatically change from Resolved back to New.

On the Results tab there are several options available as well. These options are: New Group–Click to create a new empty Clash Group. The new Clash Group can be renamed to a descriptive name reflecting the clash or group of clashes.

A Clash Group is a folder containing individual clashes. Individual clashes can be dragged and dropped into the Group.

Group Selected Clashes–Click to group selected clashes in the results table.

The new Clash Group can be renamed to a descriptive name reflecting the group of clashes.

Remove from Group–Click to remove a selected clash in a group from the group.

Explode Group–Click to ungroup the clashes in the Group and to remove the Group folder from the results table.

Assign–Opens the Assign Clash dialog to allow a project team member’s name to be assigned to the clash. Notes can also be added in the Assign Clash dialog as well.

Unassign–Unassigns a previously assigned clash.

Add Comment—Opens the “Add Comment” dialog to allow comments to be added to the clash. Comments can be reviewed through the View Comments tool located on the Review tab. There is a Status: drop-down in the Add Comment dialog that note the status of a clash but the status of the clash cannot be modified in this dialog.

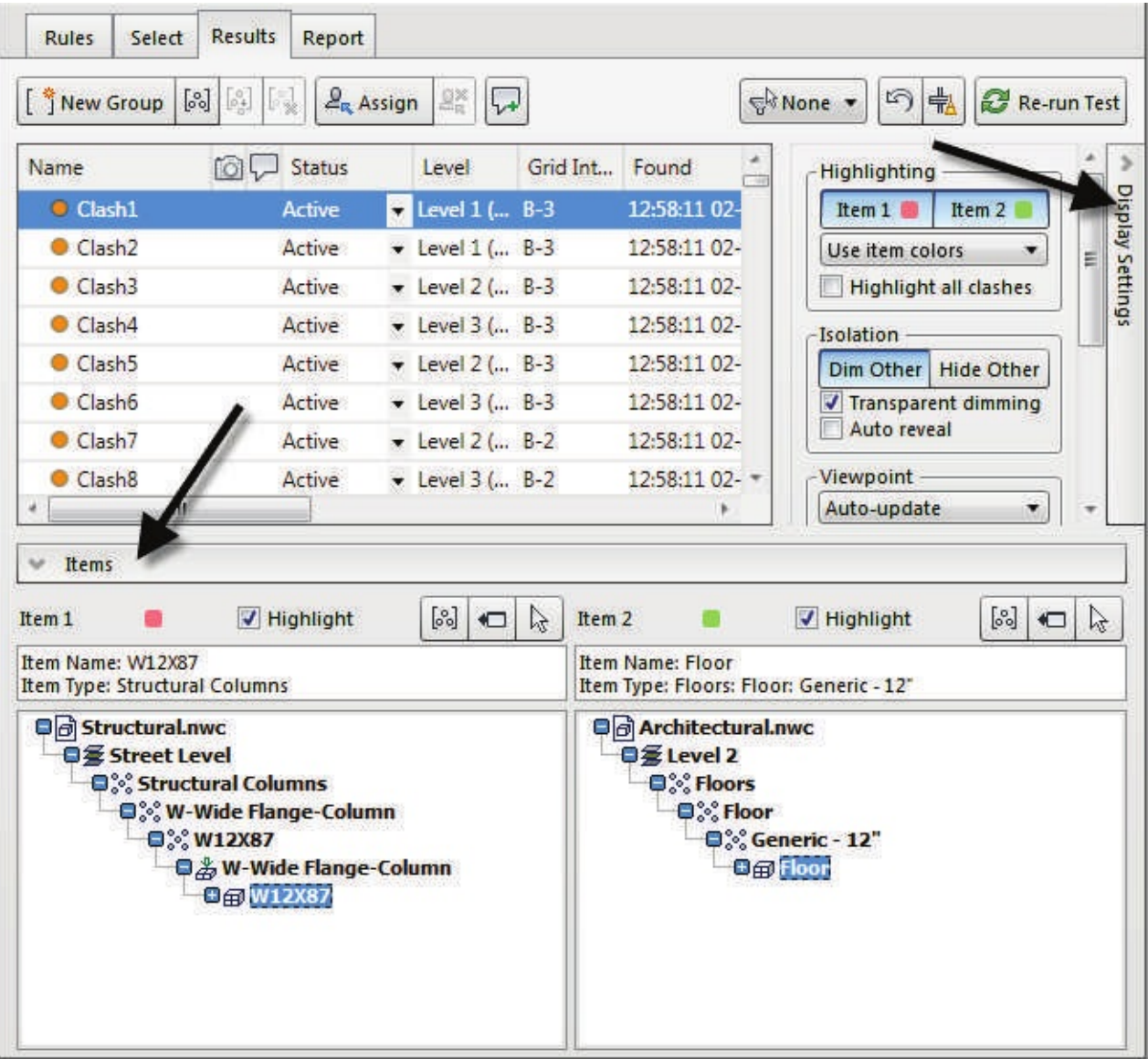
Filter by Selection—Apply a filter to show the clashes associated with the item selected in the Scene View.

None—No filter is applied. All clashes are shown.

Exclusive—Clashes will be filtered by the items selected in the Scene View. Two or more items must be selected in the Scene View. The clashes will be filtered to exclude all other clashes not belonging to the items selected in the Scene View.

Inclusive—Clashes will be filtered by the item or items selected in the Scene View. One or more item must be selected in the Scene View. The

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clashes will be filtered to include all other clashes associated to the selected item(s) in the Scene View.

Compact–Deletes all Resolved clashes from the Clash Test.

Re-run Test–Re-runs the current Clash Test and updates the results.

Reviewing 1,321 clashes can be incredibly overwhelming to anyone let alone very time consuming. Let's actually review a few of the results to determine if they are "legitimate"

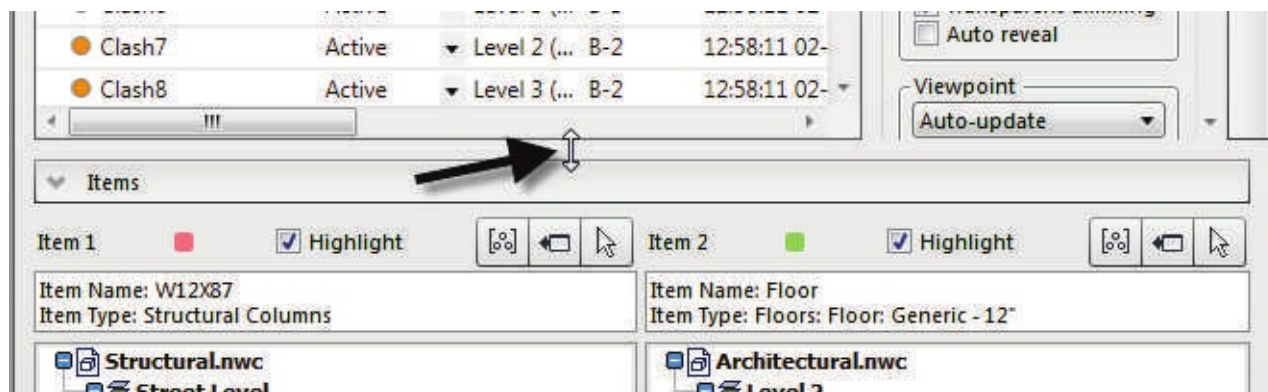
clashes. Recall our previous example of a pipe that passes through the roof structure and how this might not be a clash if that pipe is part of the plumbing vent system. Such a clash could be removed from the Clash Test thus reducing the total number of Open clashes. Before we review the Results of the Clash Test let's configure the Clash Detective window so we can better understand our clashes.

2. On the right side of the Clash Detective window click Display Settings to expand this panel.

3. At the bottom of the Clash Detective window click Items to expand (see [Figure 7.4](#)).

FIGURE 7.3

Display Settings and Items can help you better visualize and understand your clashes • Section III •



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Once Display Settings and Items have been expanded, those panels can be stretched accordingly so that they can be viewed better. To do this, simply hover your cursor between the Results window and the Display Settings panel, or the Results window and the Items panel, until your cursor displays a bi-directional arrow icon and then stretch the panel to your preference (see [Figure 7.5](#)).

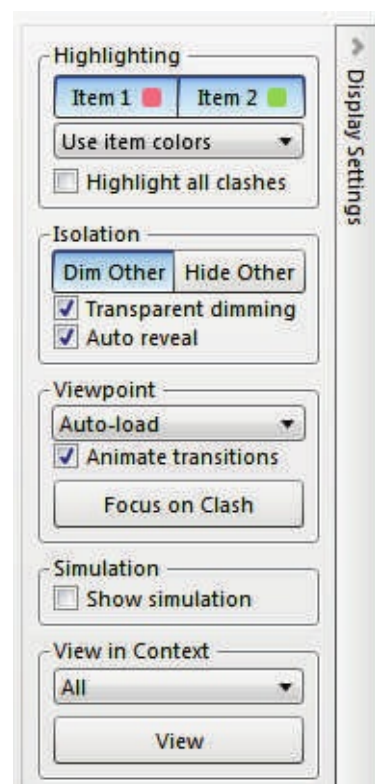
FIGURE 7.4

The Display Settings and Items areas can be stretched to make the windows more legible After Display Settings and Items have been expanded let's review a few settings that will help us visualize our clashes better. To learn more about Display Settings and Items please refer to the "Quick Reference for Display Settings and Items" below.

4. In Display Settings panel, Make sure that both Item 1 and Item 2 are active (selected).

5. Beneath the two item buttons, make sure that the drop-down is set to: Use item colors.
6. In the Isolation area, make sure that Dim Other is active (selected). Check both the Transparent dimming and Auto reveal checkboxes.
7. In the Viewpoint area, choose: Auto-load from the drop-down and check Animate transitions.
8. In the Simulation area, uncheck Show simulation.
9. In the View in Context area, choose: All from the drop-down ([see Figure 7.5](#)).

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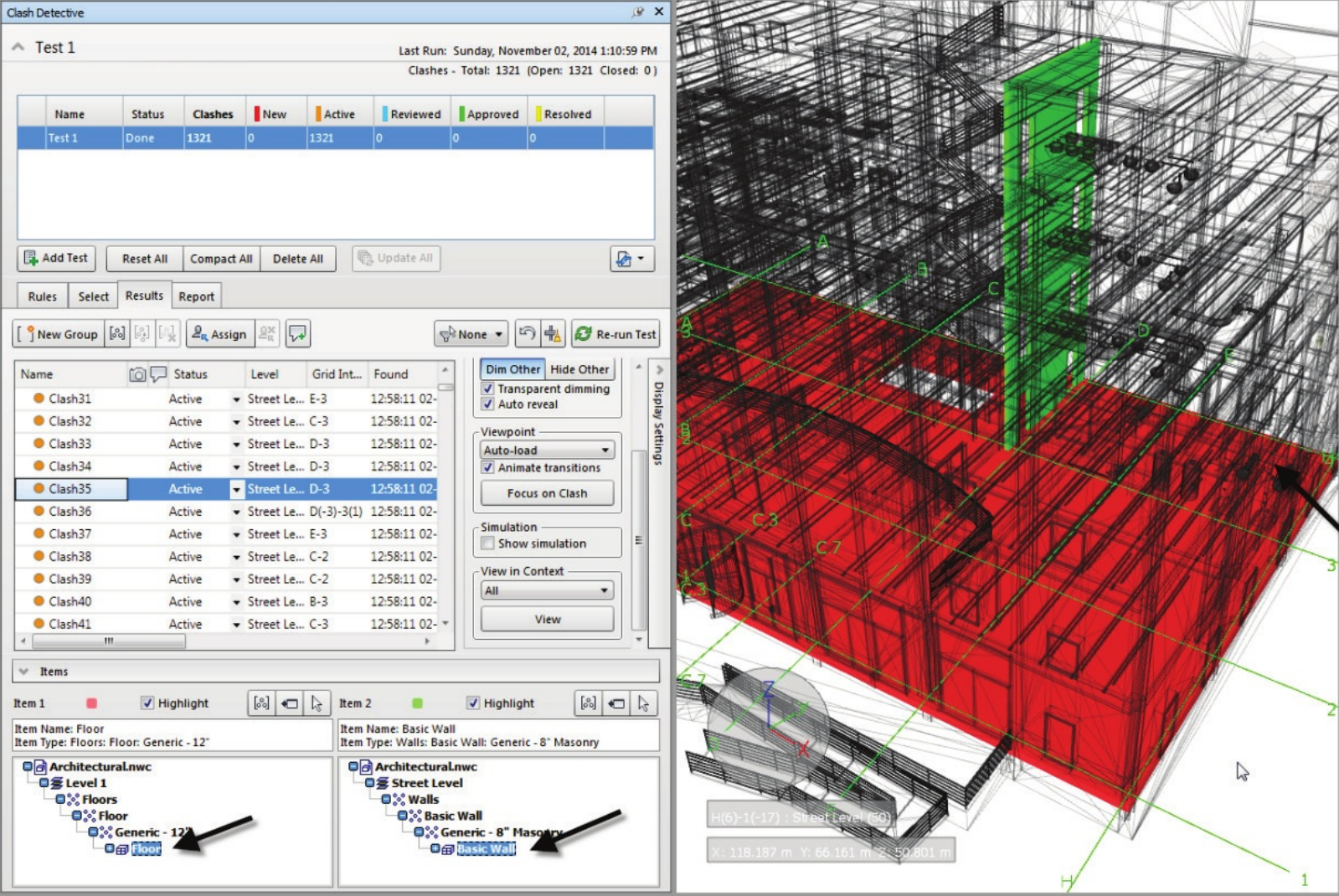
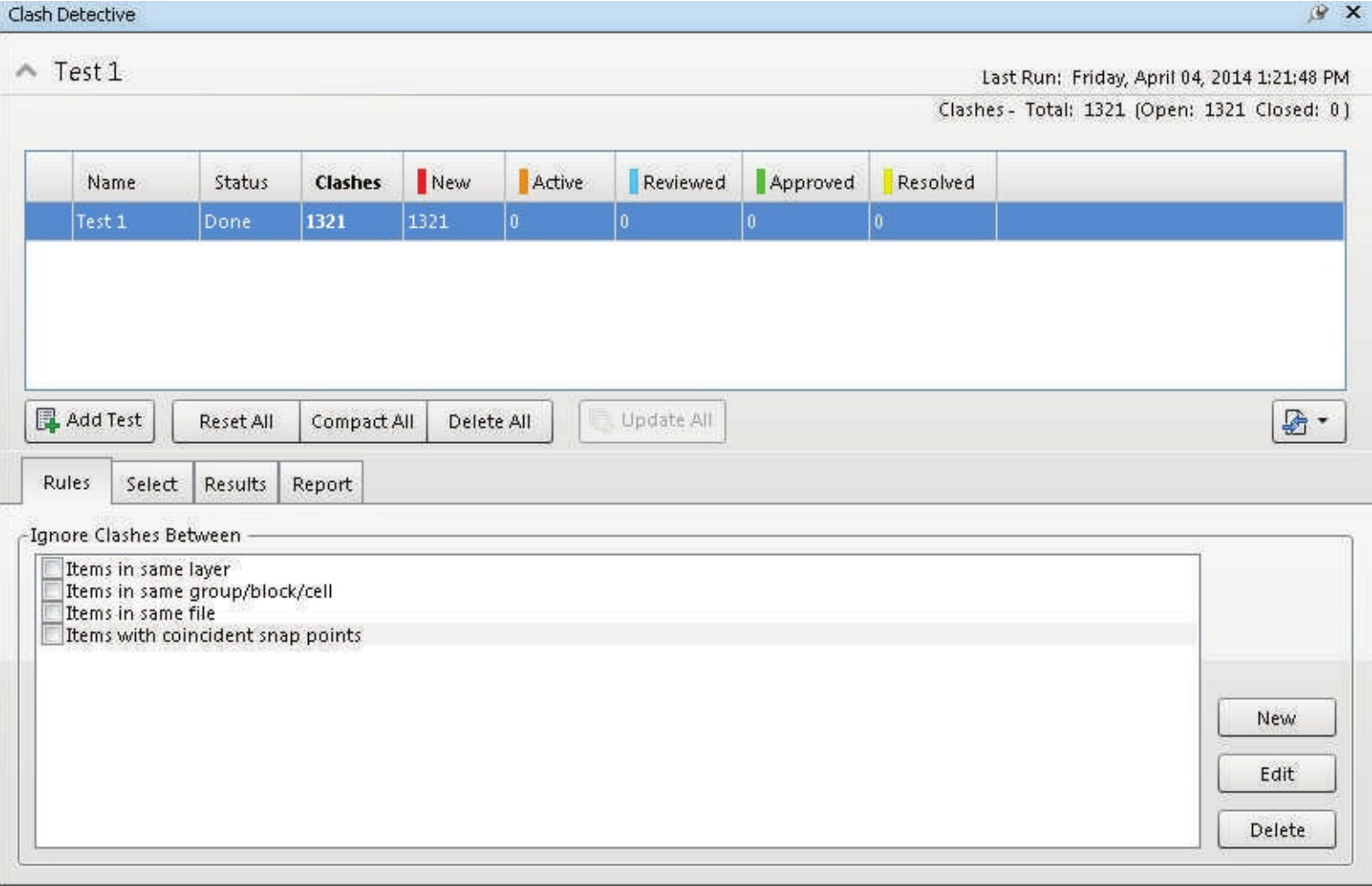


FIGURE 7.5

Configure options on the Display Settings panel 10. Using the scroll bar in the results area, scroll down and then select Clash 35 (see [Figure 7.6](#)).

FIGURE 7.6

Select a clash to view it in the items area and in the scene view • Section III •



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Notice in the Scene View, and in the Items expandable panel, that Navisworks has determined that a clash exists between a floor and a wall. However, based on construction processes we know this not to be the case as the floor should support the wall. Examples like this make perfect examples of where we can use what we learned in the previous chapters to help us remove clashes between floors and walls from the Clash Test.

CLASH DETECTIVE RULES

The Clash Detective Rules tab allows you to define rules that can be applied to Clash Tests.

Rules in Clash Detective are an effective means to exclude clashes that Navisworks might determine valid based on the parameters of the Clash Test but you know otherwise based on your own practical experience. Creating Rules to avoid certain clashes in Navisworks that can occur on every project can help you streamline your review of the results in Clash Detective.

Rules can be established either before the Clash Test is performed or after you have performed a Clash Test. As you are reviewing clashes you might discover a “common theme”

to some of the clashes however, they are not clashes based on actual construction processes.

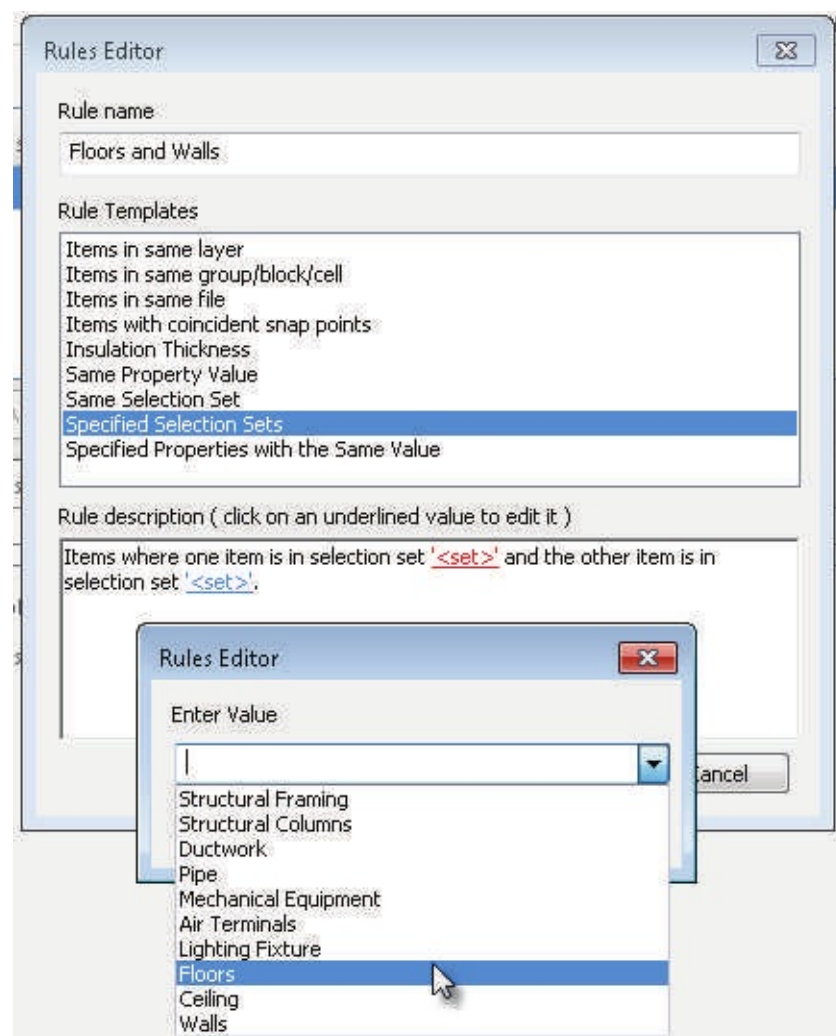
There are a few basic Rules that are available. Rules can be added, edited, or even deleted if they do not apply to the Clash Test.

Let's look at how we can add a Rule to the Clash Test that we just performed.

1. In the Clash Detective, click the Rules tab ([see Figure 7.7](#)).

FIGURE 7.7

Rules can be created to help reduce non-valid clashes from the Clash Test • Project Model Analysis •



Let's use Search Sets and create a Rule to Ignore Clashes Between floors and walls and see if that helps reduce the total number of clashes found on this project.

2. Click the New button.
3. In the "Rules Editor" dialog, input: **Floors and Walls** for the Rule name.
4. In the Rule Templates area, click Specified Selection Sets.
5. In the Rule description area, click the first '<set>' in the sentence. In the dialog that appears, click the drop-down, choose: Floors, and then click OK ([see Figure 7.7](#)).

FIGURE 7.8

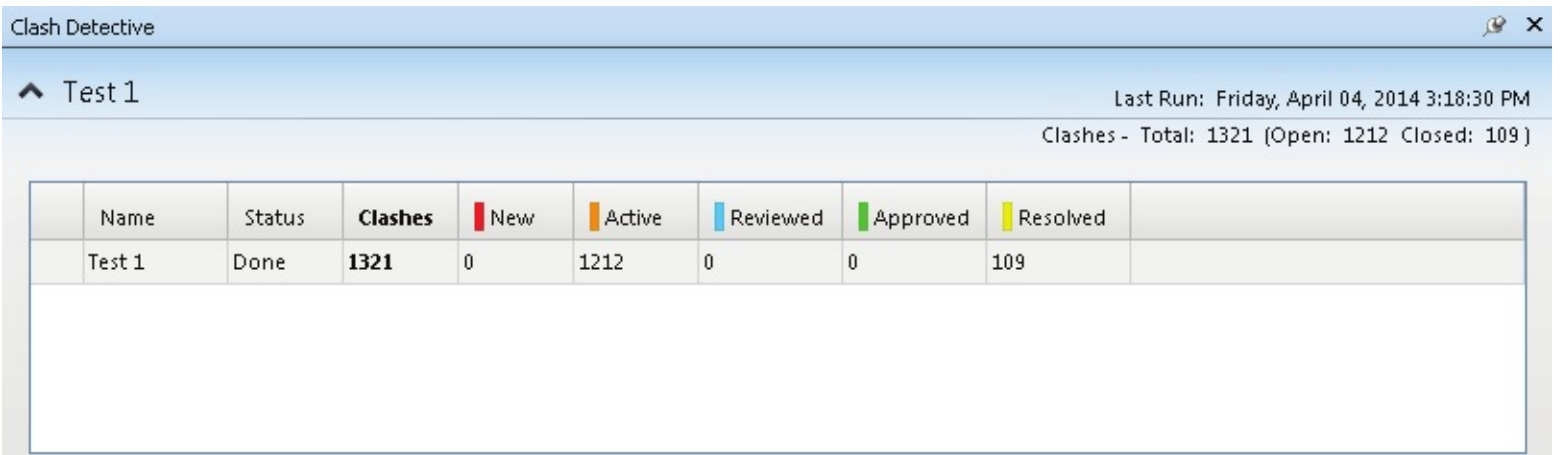
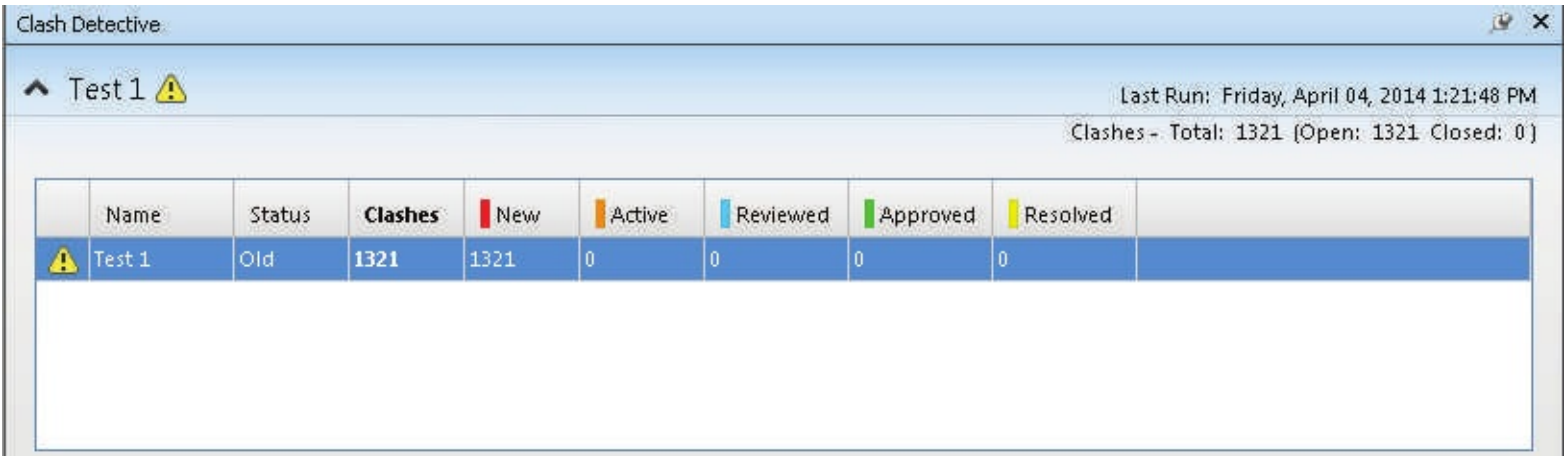
Selection and/or Search Sets can be used when creating Rules 6. In the Rule description area, click the second ‘<set>’ in the sentence, choose: Walls this time and then click OK.

7. Click Ok in the Rules Editor dialog.

We have now added a new Rule called Floors and Walls. Now we need to add this Rule to the existing Clash Test.

8. Click the checkbox next to Floors and Walls.

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At this point you should notice that the Clash Test is no longer valid or out-of-date because the parameters of the test have changed. This is represented by the alert icon next to the name of the Clash Test ([see Figure 7.8](#)).

FIGURE 7.9

When parameters of the Clash Test are modified the test needs to be re-run or updated Since our Clash Test is out-of-date we have a few options available to us. The first option is to select Reset All. Selecting this option will clear the results of our Clash Test that we previously ran. The other option is to select Update All. Selecting this option will move all New clashes to the Active column and then any new clashes discovered will be placed in the New column. Since we added a Rule to exclude clashes between floor and walls some of the clashes will move into the Resolved column. Let's update our Clash Test.

9. Click the Update All button.

Now that the Rule for floor and walls has been applied to the Clash test you should notice that 109 clashes have been Resolved and 1,212 are still active (see [Figure 7.9](#)).

FIGURE 7.10

Rules can help reduce the number of clashes If you establish Rules based on office standards or logical project constructions processes you can reduce the total number of clashes that Navisworks initially determines thus saving you time when reviewing clash results.

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CLASH REPORTS

Once Clash Tests have been created and run the results of the tests can be shared with the project team. Let's create a new Clash Test between the structural components of the building and the mechanical and piping system components and then create a report to share with the project team.

1. Click the Delete All button.

2. Click the Add Test button.

Test 1 will appear.

3. Right-click on Test 1 in the list and then choose: Rename.

4. Type: **Struct vs. HVAC** for the Name and then press ENTER.

5. In both the Selection A and Selection B areas, from the drop-down at the top of the list, choose: Sets.

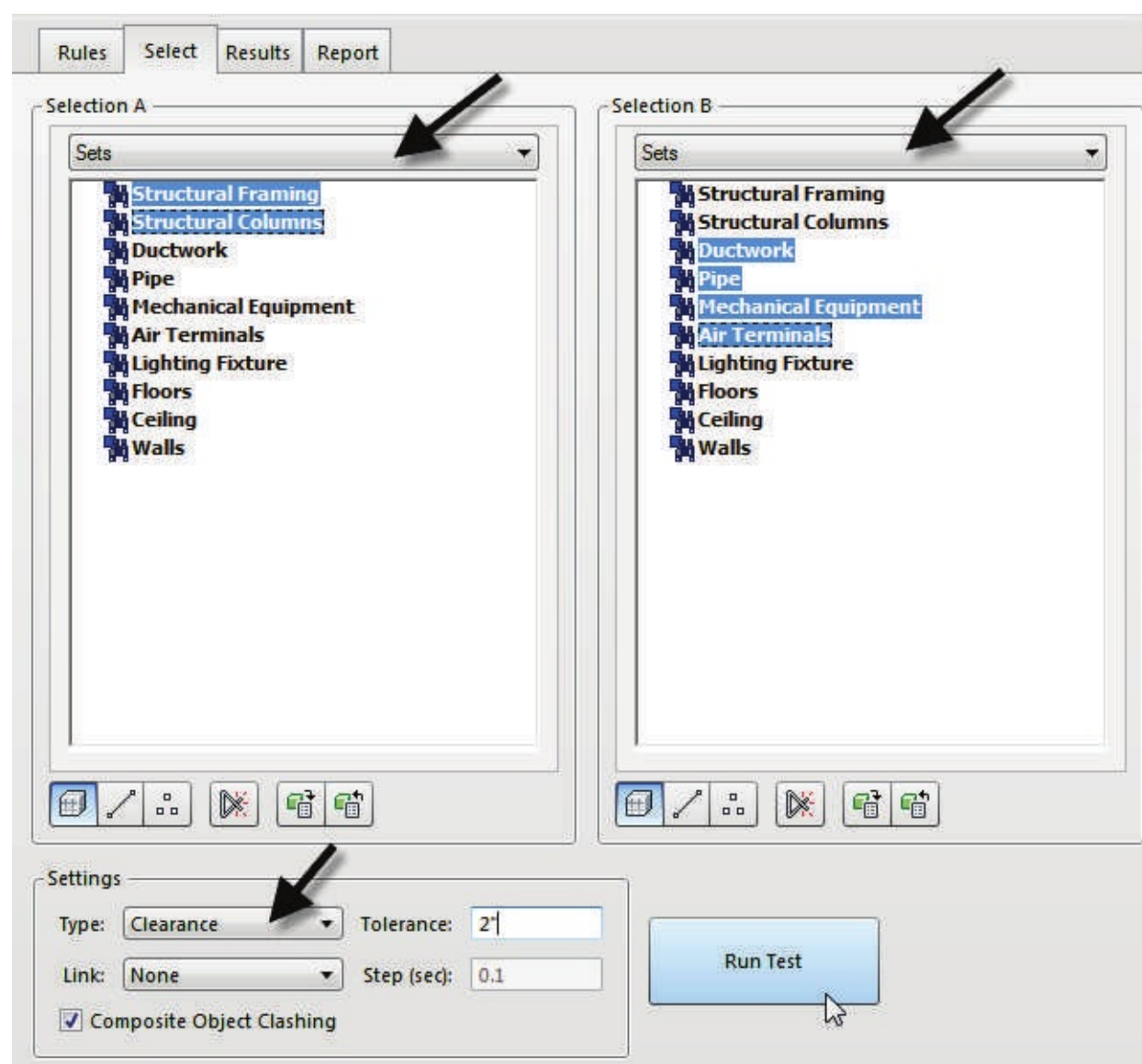
6. In the Selection A area, hold down the CTRL key and select both: Structural Framing and Structural Columns.

7. In the Selection B area, hold down the CTRL key and select: Ductwork, Pipe, Mechanical Equipment, and Air Terminals.

8. In the Settings area, for the Type, choose: Clearance.

9. Set the Tolerance to: **0'-2"** (see [Figure 7.11](#)).

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FIGURE 7.11

Configure the settings of a new test between specific types of elements 10. Click the Run Test button.

11. Click the Report tab.

There are three basic areas of the Reports tab. The left pane lets you select what information will be included in the report. Each item you check will become a column in the resulting report. For this example, we'll accept the default and leave all boxes checked. In the right pane, you can include all of the clashes or focus on only some like: new or active. For this example, we'll leave all boxes checked to report all clashes. The final area at the bottom allows you to choose the type and format for the report. If you have more than one test defined in the Clash Detective, you can combine those into a single report. In our case, we only have the one test so we'll leave this set to "Current Test." For the format, we'll choose

something user friendly.

12. On the Report tab, in the Output Settings area, from the Report Format drop-down, choose: HTML (Tabular).

13. Click the Write Report button.

14. In the dialog that appears, browse to a location where you would like to save your report.

(Any local folder is fine). Click Save.

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Clashes

file:///D:/Revit%20Local/Test%201.html

Autodesk Navisworks

Clash Report

Test 1	Tolerance	Clashes	New	Active	Reviewed	Approved	Resolved	Type	Status
	0.051m	108	108	0	0	0	0	Clearance	OK

Image	Clash Name	Status	Distance	Grid Location	Description	Date Found	Clash Point	Item 1				Item 2			
								Item ID	Layer	Item Name	Item Type	Item ID	Layer	Item Name	Item Type
	Clash1	New	-0.162	D-2 : Street Level	Clearance	2014/11/3 16:26.05	x:93.753, y:84.941, z:36.293	Element ID: 180622	Level 4	Metal - Steel - ASTM A36	Solid	Element ID: 654555	Level 3	Round Duct	Solid
	Clash2	New	-0.162	D-2 : Street Level	Clearance	2014/11/3 16:26.05	x:95.239, y:84.042, z:36.296	Element ID: 180636	Level 4	Metal - Steel - ASTM A36	Solid	Element ID: 654466	Level 3	Round Duct	Solid
	Clash3	New	-0.162	E-2 : Street Level	Clearance	2014/11/3 16:26.05	x:99.492, y:85.043, z:36.293	Element ID: 180640	Level 4	Metal - Steel - ASTM A36	Solid	Element ID: 654466	Level 3	Round Duct	Solid
	Clash4	New	-0.124	B-2 : Street Level	Clearance	2014/11/3 16:26.05	x:84.198, y:82.614, z:36.121	Element ID: 180590	Level 4	Metal - Steel - ASTM A36	Solid	Element ID: 653175	Level 3	Rectangular Duct	Solid
	Clash5	New	-0.121	E-3 : Street Level	Clearance	2014/11/3 16:26.05	x:100.712, y:93.260, z:36.245	Element ID: 180612	Level 4	Metal - Steel - ASTM A36	Solid	Element ID: 660174	Level 3	Round Duct	Solid
	Clash6	New	-0.119	E-2 : Street Level	Clearance	2014/11/3 16:26.05	x:102.260, y:86.997, z:36.245	Element ID: 180630	Level 4	Metal - Steel - ASTM A36	Solid	Element ID: 660134	Level 3	Round Duct	Solid

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Since we created an HTML report, you can use your web browser (i.e. Windows Explorer, Google Chrome or Mozilla) to view the report. Simply browse to the folder and double-click the file created and it will launch in your default web browser (see [Figure 7.12](#)).

FIGURE 7.12

Run a report and then open the result in a web browser Upon studying the result, if you wish to simplify the report, simply return to Navisworks, and on the Report tab, uncheck the items you don't want to include.

Now that you have a basic understanding of the Clash Detective tool, you can experiment further to find the optimal settings for your project team. For example, when you run a clash test that yields useful results, be sure to save it and share it with the team. This will help you save time on the next project. Over time you will accumulate a collection of useful resources including selection sets and clash test that

will help streamline work on each new project.

PREPARE TO CLOSE YOUR PROJECT FILE

If you would like to save the file you were working on herein to return to it later, you can save the project file as another name through the Application Menu with Save As. Otherwise let's close the project file without saving.

15. From the Application Menu, choose: Exit Navisworks.

16. When prompted to save the changes to the project file, click No.

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QUICK REFERENCE FOR DISPLAY SETTINGS AND ITEMS

Included here is an outline of the options available in the Display Settings and Items panels of the Clash Detective tool. This information is not part of the tutorial lesson. Feel free to review the information now if you wish, or skip it and use it later as quick reference guide as you are working with the Clash Detective tool in your own projects.

The Display Settings expandable panel:

Highlighting—This area defines how clashes will be visually displayed in the Scene View.

Item 1 / Item 2—Click either to override the color of the item in the Scene View. These work in conjunction with the “Use item colors” drop-down and the Highlight setting in the Items panel. If Item 1 or Item 2 is clicked then the Highlight setting in the Items panel becomes deselected.

The color for Item 1 and Item 2 can be adjusted through the File Options.

Please refer to: [Chapter 3](#) for additional information.

Highlighting—This drop-down defines the color override for the Clash.

Use item colors—Select this option in the drop-down to visually display the item color of the Clash by the preset color shown. The color for Item 1 and Item 2 can be adjusted through the File Options. Please refer to: [Chapter 3](#) for additional information.

Use status color—Select this option in the drop down to visually display the item color of the Clash by the status of the Clash.

Each Clash has a status associated with it. This status is updated automatically each time the Clash test is run. The Status of the Clash can also be manually updated as well. Refer to: [“Clash](#)

[Detective Results”](#) topic above for a description of the colors and status.

Highlight all clashes—Check this box to show all clashes that were found in the Clash Test in the Scene View.

Isolation—This area defines how other items around the Clash will be visually displayed in the Scene View.

Dim Other—Select Dim Other to change all the items in the Scene View that are not associated with the Clash to gray in color.

Hide Other—Select Hide Other to hide all items in the Scene View except those associated with the Clash.

Transparent dimming—This checkbox is only active when Dim Other is selected. Select the checkbox to change all the items in the Scene View that are not associated with the clash to transparent and to use • Project Model Analysis •

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wireframes for those items. The level of transparency is 85% and wireframes will be used for Transparent Dimming by default. The percentage for Dimming Transparency and Use Wireframes for Transparent Dimming settings can be adjusted through the File Options.

Please refer to: [Chapter 3](#) for additional information.

Auto reveal—Select this checkbox to hide any items obstructing the individual clash. Select this checkbox to automatically show the most severe clash in a group.

Viewpoint—This area defines the Viewpoint of the clash.

Viewpoint—This drop-down defines how the Viewpoint will be managed.

Auto-update—Select this option to automatically update the Viewpoint associated with the Clash when navigating away from or around the Clash. A new Viewpoint will be created for the Clash based on the new position of the camera in the Scene View. In addition a new Viewpoint icon will be created next to the Clash in the Results tab. After selecting the Viewpoint icon, the Viewpoint can be loaded, saved or deleted. When deleting a Viewpoint associated with a Clash, the Viewpoint will return to its original default Viewpoint.

Auto-load—Select this option to automatically zoom to default Viewpoint of the Clash. This option does not save a new Viewpoint when navigating away from the Clash.

Manual—Select this option to keep the Scene View Viewpoint static as you select a Clash to review in the Results tab. The Viewpoint of the model will not move to the Clash Viewpoint.

Animate transitions—Select this checkbox to animate the transition from one Clash to another as it is selected in the Results tab. This works best when Auto-update or Auto-load has been selected.

Focus on Clash—Click this option to reset the Viewpoint to the original default Viewpoint of the Clash.

Simulation—This area defines animation clashing.

Show simulation—Click this checkbox to use animation clashing. This allows you to move the playback slider in TimeLiner, or an animation scene, to determine the exact point that the clash occurs.

View in Context—This area defines a point of reference in the model that might help you determine the exact clash location.

Viewpoint—This drop-down defines the reference point.

All—Select this option to zoom out making the entire Scene View visible.

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File—Select this option to zoom out, using Animated transitions, so that the extents of the file is visible in the Scene View.

Home—Select this option to zoom out to the defined Home View.

View—Click and hold View to zoom out in the Scene View and hold that position until the hold is released and at that point it will zoom in again to the clash location. If View is clicked once it will zoom out, briefly hold its position, and then zoom in to the clash again.

The Items expandable panel:

Highlight—Use this checkbox to override the color of the item in the Scene View with the predefined color of the clash. The color for Item 1 and Item 2

can be adjusted through the File Options. Please refer to: [Chapter 3](#) for additional information.

Group Clashes Involving Item—Click to find all clashes involving this Item (Item 1 or Item 2) and add them to a Group. A new folder will be added in the Results called New Group. It is recommended that you rename this folder to a name that defines the group of clashes.

Switchback—Click to view the selected item in the authoring software.

Interaction with the authoring software through the Switchback tool is currently limited to AutoCAD, Revit, and Microstation. When multiple items are selected in the pane, Switchback is not available.

Select in Scene—Click to select the item in the Scene to display additional information about the item in the Properties window. Press ESC to deselect the item again.

Right-click Items panel contextual menu:

Select—After selecting an item in the left or right pane, use this to highlight the item in the Scene view.

Import Current Selection—After selecting an item in the Scene View, the item will be highlighted in the

left or right pane if it is associated with the hierarchy of the clash.

Group Clashed Involving Item—Click to create a new Group that contains all clashes involved with the item(s) selected in the left or right pane.

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SUMMARY

The Navisworks Clash Detective tool allows you to identify those elements that physically clash with one another in the project model. Identifying such clashes in the computer allows issues to be addressed before they become costly construction mistakes.

Clash Tests can be created from a group of items, like Selection or Search Sets, in order to identify conflicts between specific disciplines or building components.

Clash Results can be grouped to allow all clashes pertaining to a particular item to be grouped together for review.

Rules can be applied to Clash Test in an effort to eliminate invalid clashes based on practical construction processes.

Specific data regarding clashes can be included in a Clash Report and shared with the entire project team in a variety of user friendly formats.

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Chapter 8

Measure and Redline

INTRODUCTION

When you perform a clash detection on the project, clash reports can be generated and shared with the team. Although reports are helpful in conveying project related conflicts to the project team, there might be a desire to convey information in a more interactive way.

This can be done directly in the Navisworks project model through the Measure and Redline tools. In this chapter we will explore the Measure, Redline, and Tag tools. These can help you convey design or project related information to the project team.

OBJECTIVES

To acquaint you with the Navisworks Measure, Redline, and Tags tools that allows you to convey additional information to the project team through the Navisworks project model.

Topics we will explore include:

- Measuring the distance between items in the project model to better understand the spatial area of the building components.
- Creating Redlines to provide additional annotation to aid reviewers of the project model.
- Tagging items in the project model to in an effort to convey specific comments to the project team.

NAVISWORKS MEASURE, REDLINE AND TAGS

Navisworks provides Measure, Redline, and Tag tools to allow information to be conveyed directly within the project model. Measure tools allow you to make linear, angular, and area measurements from the project model. Measurements can then be converted to Redlines.

Redlines and Tags, also known as Review tools, allow you to annotate viewpoints and clash detection results. Tags can be placed anywhere in the Scene View. A new Viewpoint will be

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automatically created from any tag added. This Viewpoint can be shared with the project team.

OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for instructions.

1. Launch your Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

3. In the Open dialog, browse to the location where you installed the dataset files.

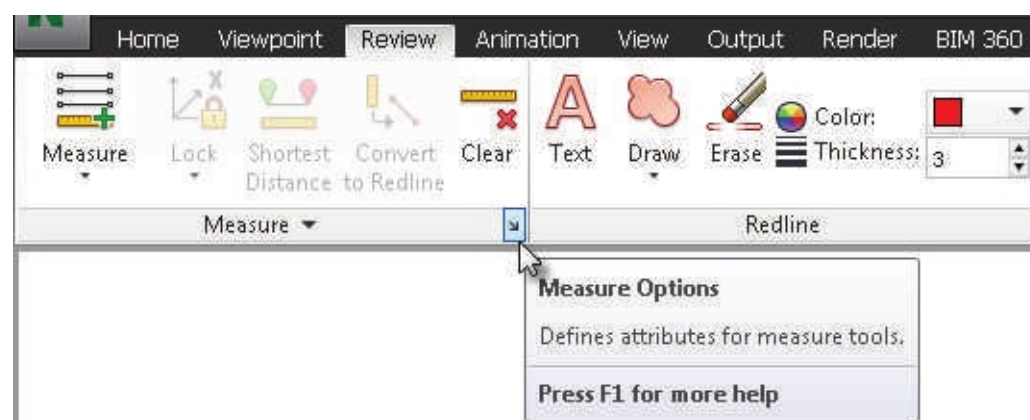
4. In the *Chapter08* folder, select the *08 Architectural.nwf* file and then click Open.

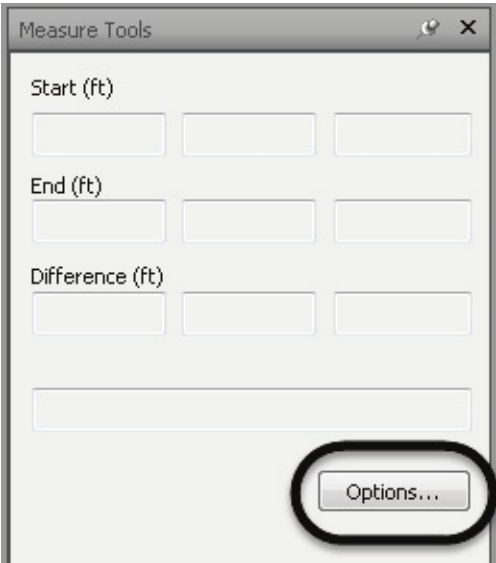
Note: Use the Files of type: drop-down in the Open dialog to either display all the Navisworks files in a folder or isolate particular types of Navisworks files, in this case NWF files.

5. Above the ViewCube, click the home icon.

You should now be looking towards the front of the building. This project model only consists of the architectural building components. The project site, structural, and mechanical components are not included in this file.

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MEASURE

Navisworks Measure tools allow you to measure the distance between two points, multiple points, angular measurements, and even area measurements as well. Any measurements can then be converted to a Redline if desired. Once converted to a Redline a new Viewpoint is created for this information to be saved with the project model.

1. Using the ViewCube, navigate to the Back view.
2. Click the Review tab and then click the Measure Tools Dialog Launcher to open the Measure Window (see [Figure 7.2](#)).

FIGURE 8.1

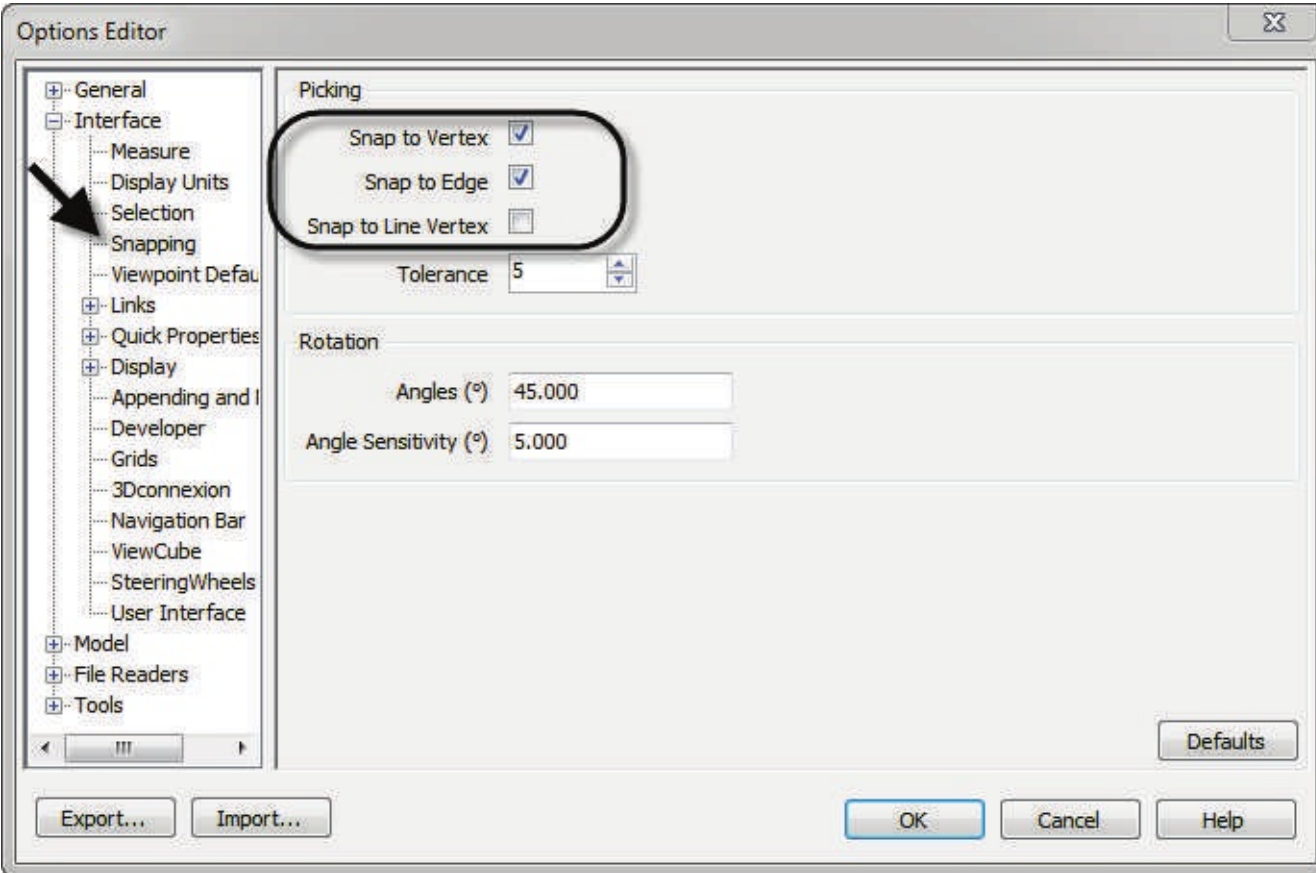
The dialog launcher can be used to open the Measure window If necessary, pin the Measure Tools window open.

3. In the Measure Tools window, click the Options button (see [Figure 8.3](#)).

FIGURE 8.2

If you wish to modify the measure settings, use the Options button on the Measure window This opens the “Options Editor” directly to the Measure tab which allows you to adjust the Line Thickness, color, etc. of the dimension lines. We will not make any adjustments to these settings at this point, but if you would like to learn more, please review the [“Global](#)

[Settings”](#) topic in [Chapter 3](#).



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4. Review the settings (if desired, make adjustments).

Depending on what you are trying to measure, the measure tools in Navisworks can be challenging to use. To help reduce some of these challenges, let’s adjust a few of our snapping settings. This is also accomplished in the “Options Editor.”

5. In the Options Editor dialog, directly below Measure, click Snapping.

6. Check both: Snap to Vertex and Snap to Edge.

7. Uncheck Snap to Line Vertex and then click OK (see [Figure 8.3](#)).

FIGURE 8.3

Configure snap settings

Now let’s measure the distance between a few items.

8. Zoom to the area around the two windows near the upper left corner of the building, near the two windows. Zoom to position the two windows fully in your Scene View.

We will be measuring the distance between these two windows at these two points (see [Figure 8.4](#)).

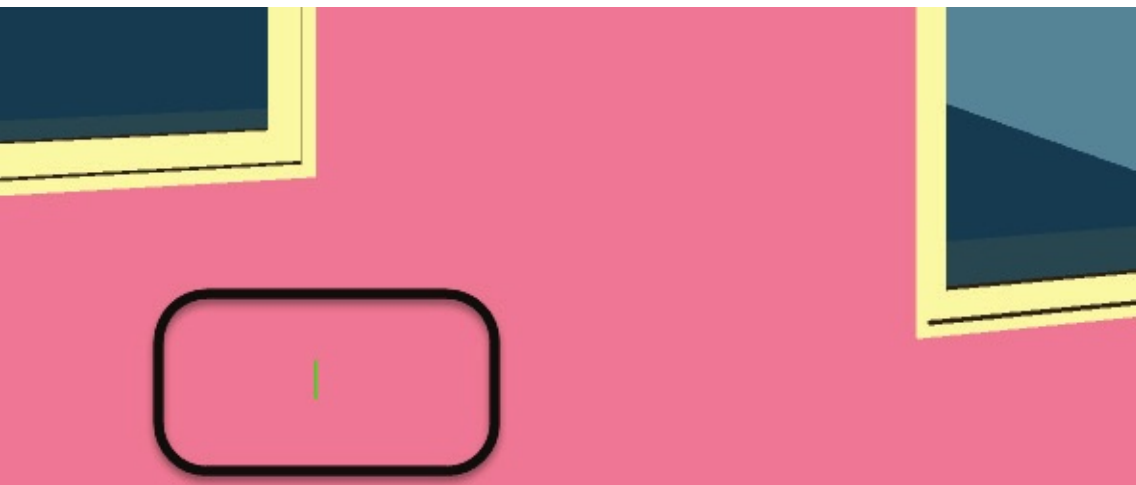
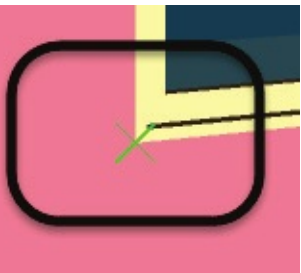
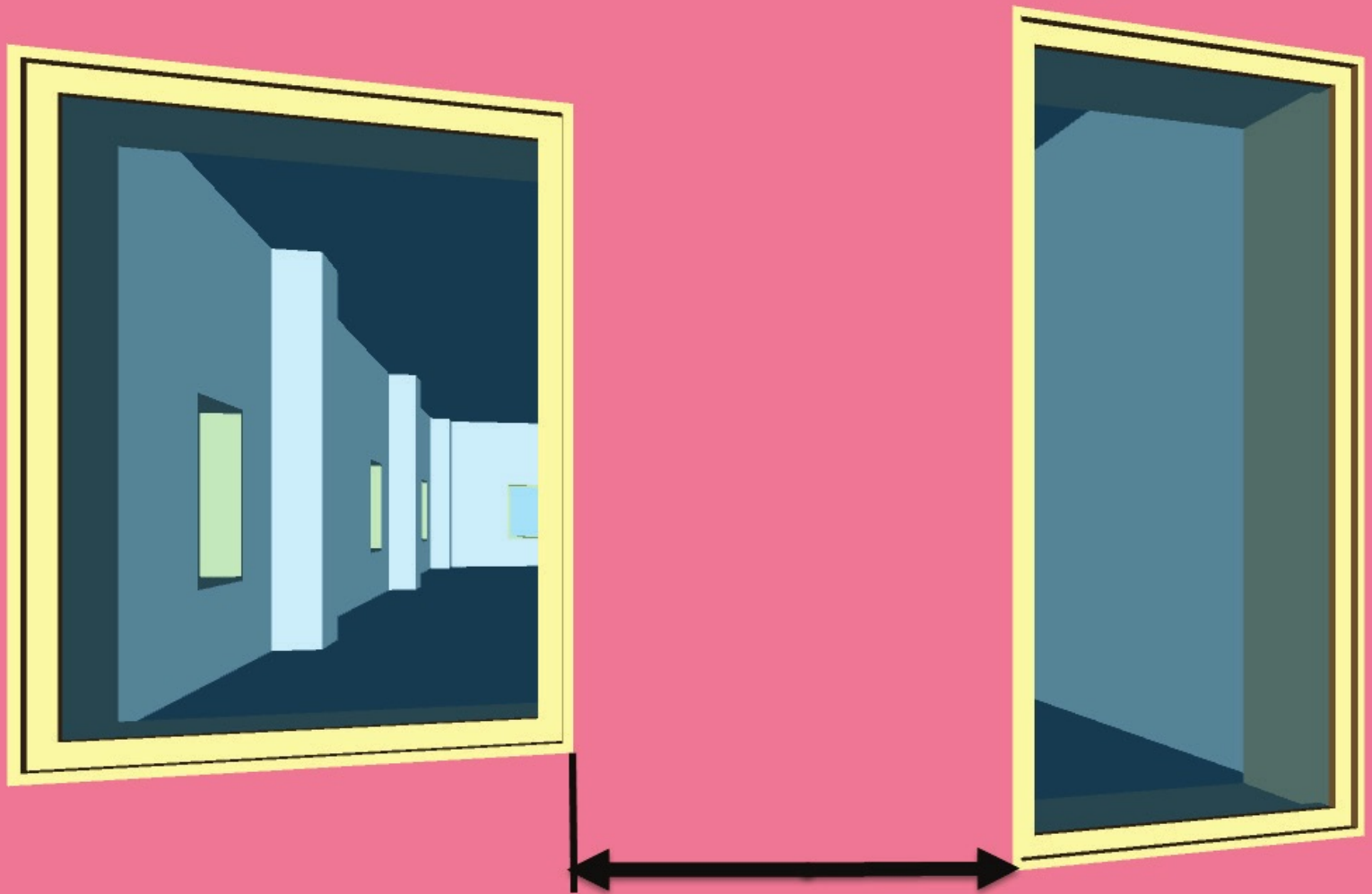


FIGURE 8.4

Distance can be measured between two points 9. On the Review tab, on the Measure panel, click the Measure drop-down and then choose: Point to Point.

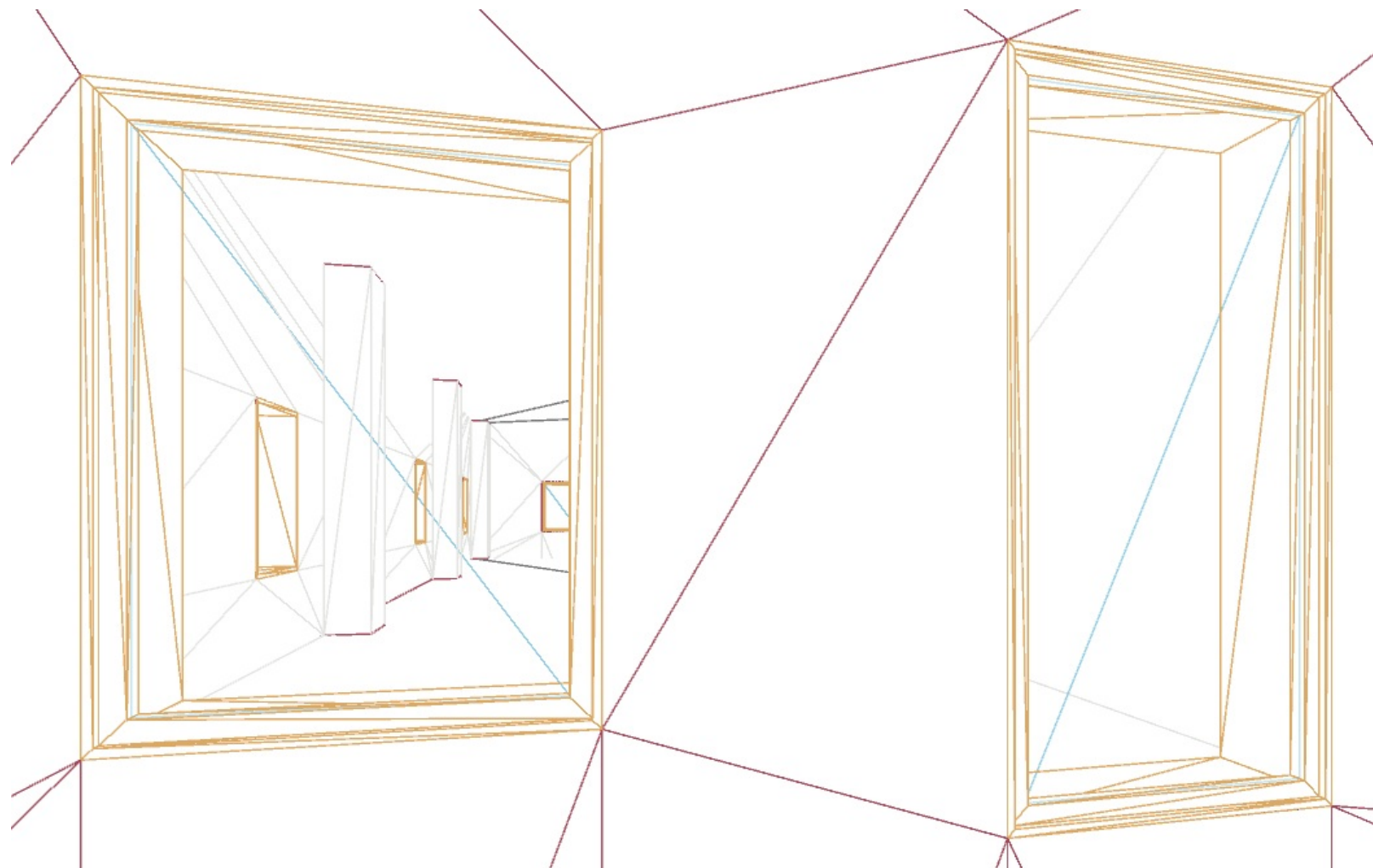
10. Hover over the lower left hand corner of the taller window until an X appears and then click for the starting point of the measurement (see [Figure 8.5](#)).

FIGURE 8.5

A snapping point reveled when using the Measure tool 11. Move the cursor to the left towards the other window until a smaller line appears indicating that you aligned with the other window (see [Figure 8.6](#)) but do not click.

FIGURE 8.6

A snapping point reveled when using the Measure tool • Project Model Analysis •



Before clicking what are we really aligned with? As previously mentioned, the geometry in Navisworks is constructed with triangles and therefore the cursor will snap to edges where those edges are available. Let's look at how we can expose those triangles and edges to confirm our snap locations.

12. On the Viewpoint tab, on the Render Style panel, click the Mode drop-down and then choose: Hidden Line (see [Figure 8.7](#)).

FIGURE 8.7

Switching to Hidden Line can reveal snapping points and edges for measuring TIP: Viewing a Navisworks project model in Hidden Line Mode helps clarify which vertex or edge is available for snapping.

We still have the Point to Point Measure tool active. Let's use the Hidden Line Mode to make a better measurement.

13. Hover over the lower left hand corner of the taller window until an X appears and then left click for the starting point of the measurement.

14. Move the cursor to the left towards the other window until a smaller line appears indicating that you are aligned with the other window. Make sure to hold the measurement line as parallel as possible to the other horizontal building lines (not triangular lines) in the project model and then click to place the measurement (see [Figure 8.8](#)).

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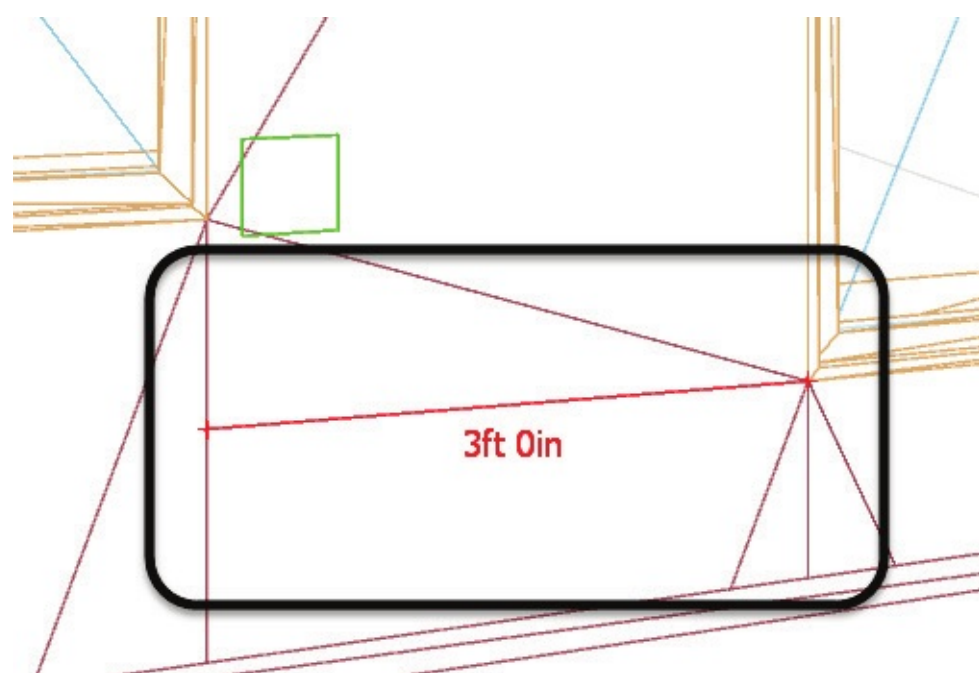


FIGURE 8.8

Switching to Hidden Line can help improve the accuracy of measurements Note the data in the Measure Tools window regarding the measurement that was just made.

This information will remain until another tool is evoked, or on the Review tab, on the Measure panel, you click the Clear button. In either case, the measurement will be removed from the Scene View and is no longer available. If this measurement is a critical piece of information that needs to be shared with the project team, the measurement can be saved as a Viewpoint. Let's review how this can be accomplished.

15. On the Review tab, on the Measure panel, click the Convert to Redline button.

The Saved Viewpoints window will appear and a new View will be available in the Saved Viewpoints window representing the Viewpoint and measurement that you just made (see [Figure 8.9](#)).

FIGURE 8.9

Measurements can be converted to Red Lines and are saved as Viewpoints The Viewpoint can now be renamed to something more descriptive.

16. In the Saved Viewpoints window, right-click on View and choose: Rename.

17. Input a descriptive name such as: **Distance between Windows, NW corner, Level 4** and then press ENTER.

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Let's look at another way we can measure items and how we can remove measurements once they are made.

18. On the ViewCube, click Back.

19. On the Home tab, on the Select & Search panel, click the Select button.

20. On the Viewpoint tab, on the Render Style panel, click the Mode drop-down and then choose: Shaded.

21. Zoom to the same two upper windows again, filling the scene view with their extents.

22. Select the two windows.

23. On the Review tab, on the Measure panel, click the Shortest Distance button.

Notice the distance between the two items and the points they were measured from. The Shortest Distance tool allows you to quickly receive dimensional data about the position of two items in relationship to each other but you do not control the vertex or the edge that Navisworks snaps to. If you no longer need this measurement, you can simply clear it.

24. On the Review tab, on the Measure panel, click the Clear button.

Now that you have seen an example of how the measurement tools function, feel free to experiment with the remaining tools. Here is some information to assist you in your explorations:

Multiple Points—Measures the distance between a base point and various other points.

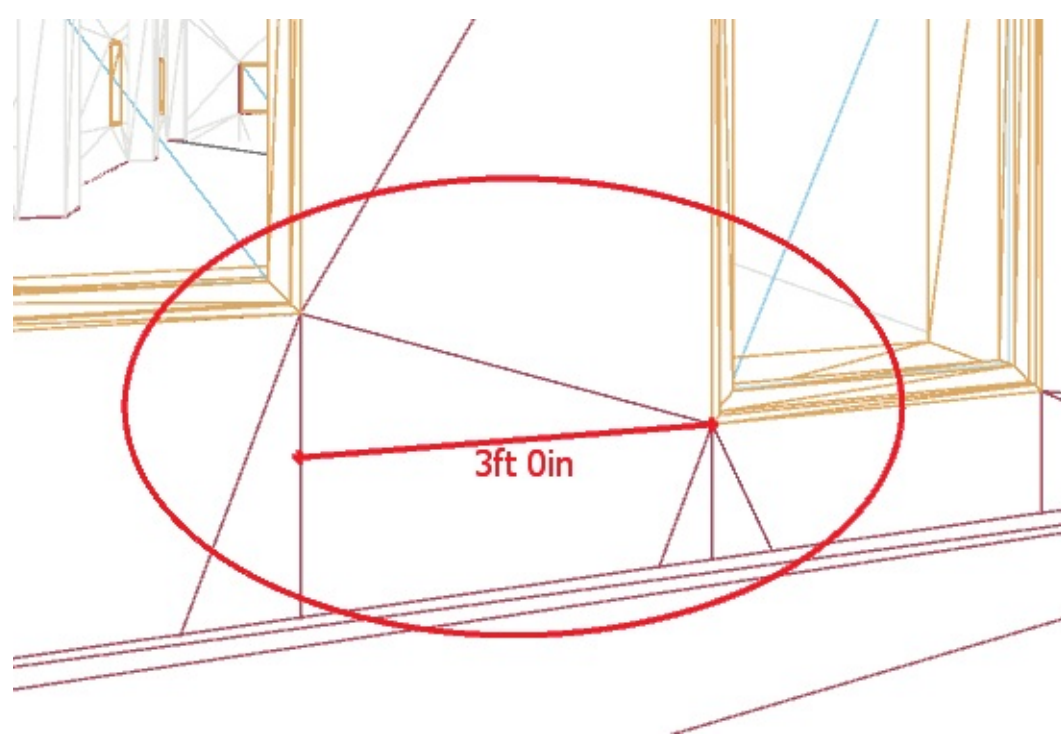
Point Line—Measures the total distance between multiple points along a selection route.

Accumulate—Measures the sum total of several Point to Point measurements.

Angle—Calculates the angle between two imaginary lines. Click a total of three points to determine the angle, where the middle point is the vertex of the angle being measured.

Area—Calculates the area on a plane as determined by three or more clicked points.

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REDLINES

The Redline tools enable you to markup Saved Viewpoints and Clash Results. Redlines can only be added to a Clash Result that has a Saved Viewpoint. The color and thickness of the Redline can be adjusted, however, this will only apply to Redlines that have yet to be placed not existing Redlines in the project file.

25. In the Saved Viewpoints window, click the Saved Viewpoint created above (named: *Distance between Windows, NW corner, Level 4* or whatever you chose to rename it to).

26. On the Review tab, on the Redline panel, click the Draw drop-down and then choose: Ellipse.

The Redline Ellipse tool behaves such that the ellipse will be inscribed in a rectangle that is drawn in the Scene View.

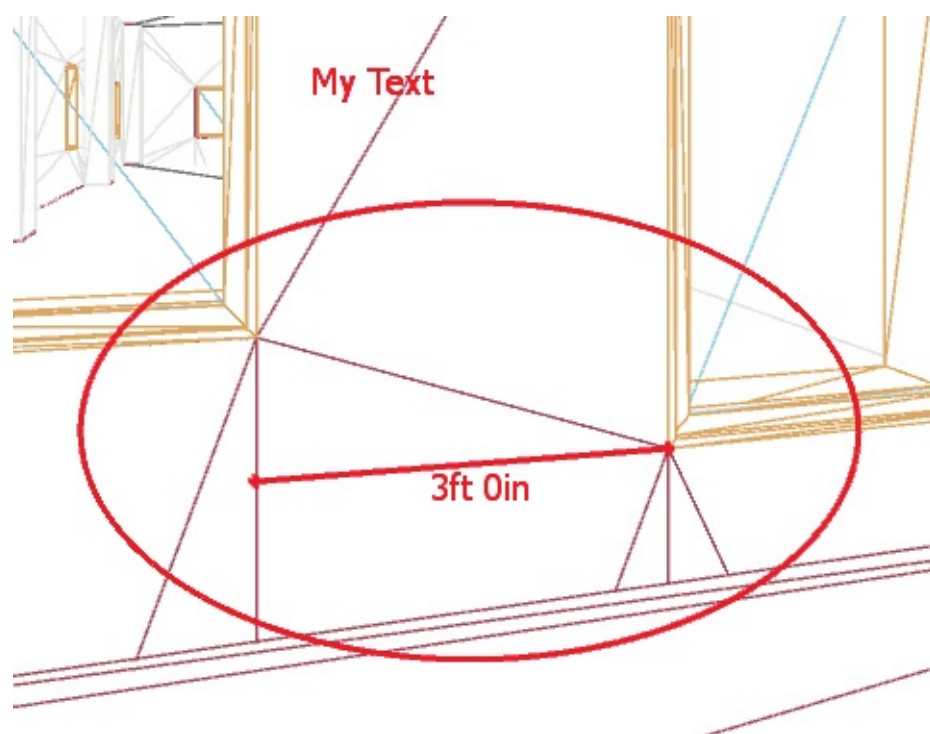
Prior to placing the Ellipse in the Saved Viewpoint, you can adjust the color or line thickness on the Redline panel if you would like.

27. Click and drag from a point above and to the left of the dimension down and to the right ([see Figure 8.10](#)).

FIGURE 8.10

Redline Draw tools allow additional drawing notation to be placed in a Saved Viewpoint If you are not satisfied with the placement of you Ellipse you can erase it using the Erase tool.

However, be careful with the erase tool. It behaves just like the ellipse tool did. You drag out a rectangular box and everything in the box will be erased. In [Figure 8.10](#) the Ellipse completely surrounds the dimension and if you use the Erase tool to erase the Ellipse you will also erase the dimension as well. Therefore, the best advice to give when using the Redlines • Project Model Analysis •



tools, depending on the task you are performing, is if you are not satisfied with the results of the Redline Draw tool sometimes it is easier to Undo and start over. Now let's look at adding Text to the Saved Viewpoint as well.

28. On the Review tab, on the Redline panel, click Text.
29. In the Scene View, click a point above the Ellipse that was just placed and in the dialog that appears type in some text and then click OK (see [Figure 8.11](#)).

FIGURE 8.11

Text can be added to a Saved Viewpoints 30. To Terminate the Text tool, press CTRL + 1 to engage the Select tool.

Any Redline comments added to a Saved Viewpoint are automatically saved with the Viewpoint. There is no need to save any additional or new Viewpoints.

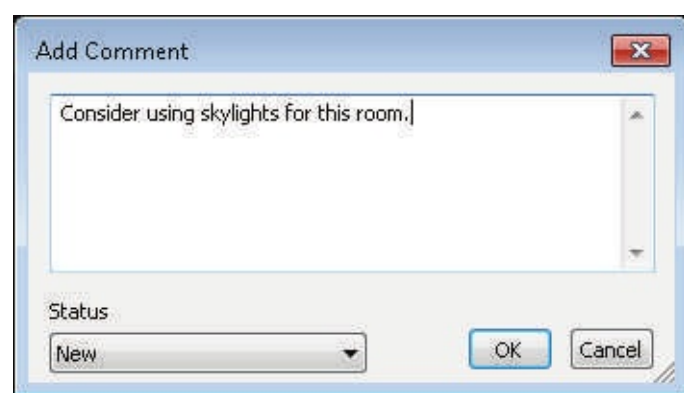
The remaining redline tools work similarly. Feel free to experiment with the Cloud, Freehand, Line, Line String, and Arrow Draw tools. Since its behavior can be a bit unexpected, you also might want to experiment with the Erase tool as well.

TAGS

Tags behave similarly to Measure and Redline tools. When you are tagging an item a Saved Viewpoint will automatically be created for the tag you want to place. Once the tag has been placed you can use the View Comments tool or the Find Comments tool to edit or locate tags in the project model file.

1. On the ViewCube click Back.

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2. On the Viewpoint tab, on the Render Style panel, click the Mode drop-down and then choose: Shaded.
3. Using the zoom tools, zoom to the window in the mechanical penthouse located at the roof level.

4. Double-click the window located in the mechanical room.
5. In the “Add Comment” dialog input: **Consider using skylights for this room** and then click OK.

FIGURE 8.12

Tags can be added to items in the Scene View A new Tag View will appear in the Saved Viewpoints window representing the Tag we just associated with the window ([see Figure 8.13](#)). The Viewpoint can now be renamed to something more descriptive for the condition.

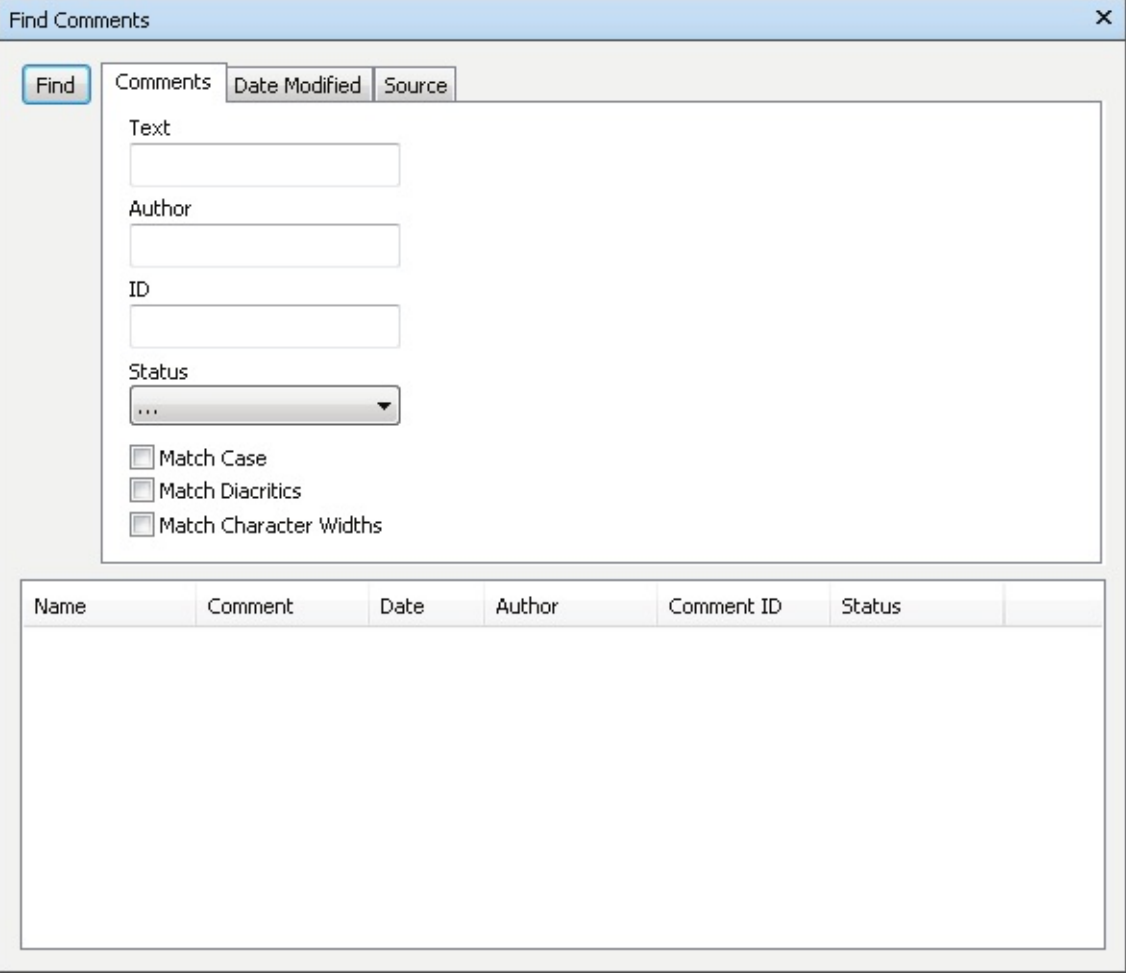
FIGURE 8.13

Tags are saved as Viewpoints

Now that we have placed a Tag in our project model file let’s review how to view Tag comments after they have been placed.

6. To Terminate the Tag tool, press CTRL + 1 to engage the Select tool.
7. On the ViewCube, click the Home icon.

Let’s assume that you passed along information to the project team that you tagged a few items that need to be reviewed, however, you cannot remember the specific wording of the • Project Model Analysis •



Tag or the Saved Viewpoint name. Let’s review how the project team can search for those tags.

- 8. On the Review tab, on the Comments panel, click the Find Comments button.
- 9. On the Comments tab clear all check boxes.
- 10. Click the Status drop-down and then choose: ... (see [Figure 8.14](#)).

FIGURE 8.14

Tags can be located based on the Tag Text, Author, ID, or Status We have cleared all search criteria from this tab. However, in cases where you know a particular string of text that you are searching for, or perhaps who created the tag, you can use the text fields to input part of the comment or the author name. Using the ellipsis (...) for the Status drop-down searches all statuses, but you can limit the search to a particular status as well.

- 11. Click the Date Modified tab.

If you knew the approximate date that the Tag was created you could use that data to help locate the Tag in the project model.

12. Choose: All comments (see [Figure 8.15](#)).

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Find Comments

Find

Comments

Date Modified

Source

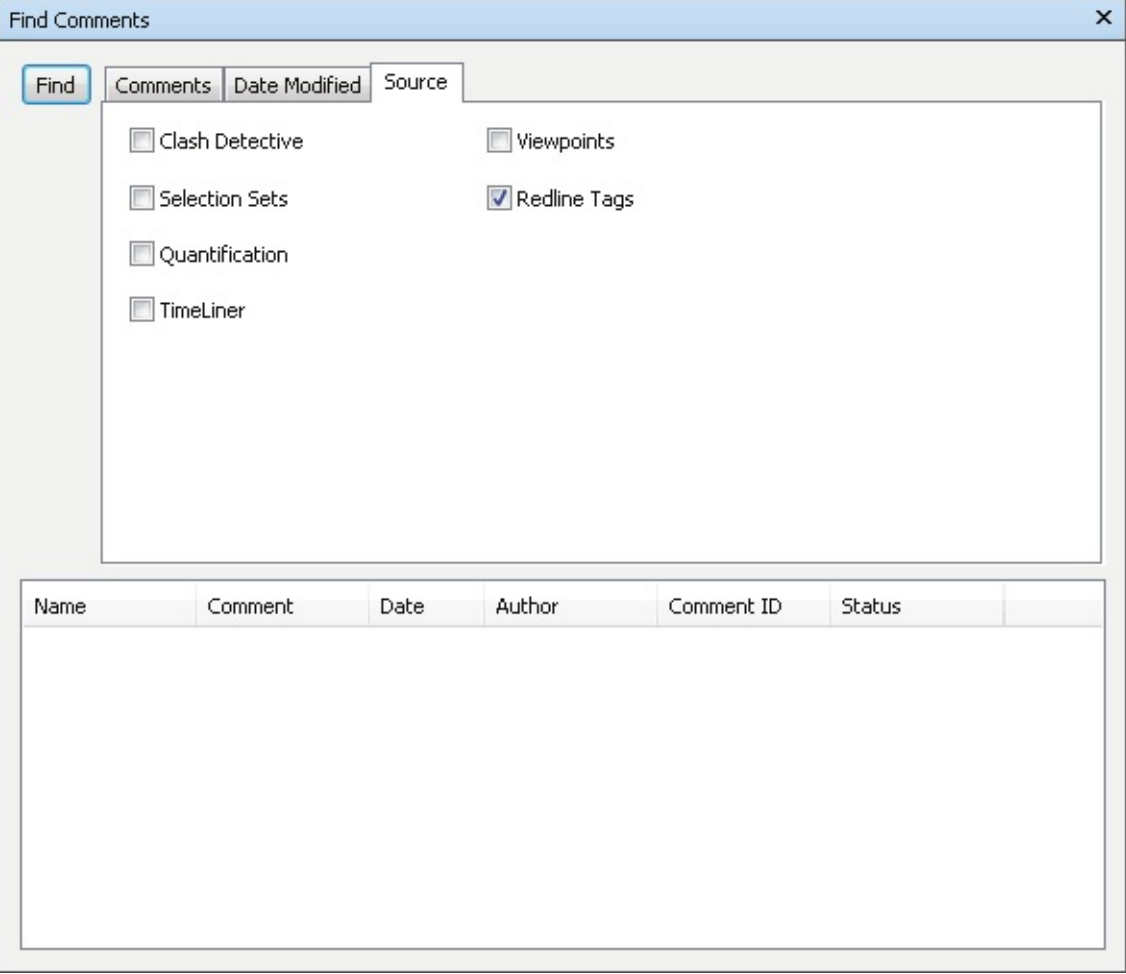
All comments

between4/ 5/2014and4/ 5/2014

during the previous1month(s)

during the previous1day(s)

Name	Comment	Date	Author	Comment ID	Status	
------	---------	------	--------	------------	--------	--



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FIGURE 8.15

Tags can be located based dates

13. Click the Source tab.

Since we know that the Tag created was a Redline Tag we will use that search criteria to locate the tag.

14. Deselect all checkboxes except Redline Tags (see [Figure 8.16](#)).

FIGURE 8.16

Tags can be located based on the Source of the Tag 15. Click the Find button.

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16. Click the Name and close the Find Comments dialog.

Since you are now in the Saved Viewpoint that the Tag was created in you can review the data associated with this particular Tag.

17. On the Review tab, on the Comments panel, click View Comments.

The Comments dialog now displays the text associated with the Tag (placed in the steps above). To Edit or Delete the Comment select the Comment in the Comments dialog and right-click. If Delete Comment is selected the Comment and the tag will be deleted from the Saved Viewpoint but the Saved Viewpoint will not be deleted.

18. Close the Comments dialog.

Feel free to continue experimenting with any of the Measure, Redline and Tag tools before continuing.

PREPARE TO CLOSE YOUR PROJECT FILE

If you would like to save the file you were working on herein to return to it later, you can save the project file as another name through the Application Menu with Save As. Otherwise let's close the project file without saving.

19. From the Application Menu, choose: Exit Navisworks.

20. When prompted to save the changes to the project file, click No.

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SUMMARY

Use the measure tools to report distances and sizes from your Navisworks model.

Use these values onscreen or convert them to redlines. Add additional redlines manually with the tools on the Review tab. Tags allow you to add comments to your redlines that are visible by other members of the project team.

Dimensional data can be obtained and reviewed in the Navisworks project model.

Optionally convert measurements to Redlines, to share with the project team.

Redlines create Saved Viewpoints making them easy to locate and review later.

Additional drawing annotations, like clouds or ellipses, etc., and text can be added to Saved Viewpoints to clarify the intent of the viewpoint.

Tags, containing comments regarding building components or other project information, can be added to Saved Viewpoints.

The project team can use the data associated with the tag to search for the specific tag and to view the Saved Viewpoint containing the Tag and its associated data.

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Chapter 9

TimeLiner

INTRODUCTION

In this chapter we will look at the TimeLiner tool. TimeLiner is an incredible powerful tool that allows you to apply the 4D (construction simulation) aspect to your project model through schedule simulation. TimeLiner can import schedules from a variety of sources (Microsoft Project, Primavera, etc.) and connect the scheduled tasks with the items in the project model creating a simulation of the building construction. This allows you to review the effects of the schedule on the project model, both planned and actual construction times, and costs can even be assigned to the tasks in order to track the cost of the project throughout its construction schedule. TimeLiner also allows you to link animations to the TimeLiner tool. For example, will there be impacts from the location of the crane and its swing based on the construction of the building project? TimeLiner even allows images and animations to be created based on the simulation. If a construction schedule changes, TimeLiner will automatically update the simulation. The overall goal of this chapter is to help you understand the potential of the TimeLiner tool and help you convey the construction of your project to the project team through simulation.

OBJECTIVES

To acquaint you with the TimeLiner tool that allows you to apply the 4D aspect (construction simulation) to your building project. This allows the project team to identify any construction issues based on the simulation of the project model. Topics we will explore include:

- Create Tasks in TimeLiner.
- Apply Selection and/or Search Sets in TimeLiner.
- Apply an external data source to simulate the construction of a building project.
- Assign a Task Type to each Task.

INTRODUCING TIMELINER

Navisworks provides a powerful tool that allows you to simulate the construction of your building project. The simulation can then be shared with the project team to review any potential issues with the construction of the project before they are discovered on site. In addition, TimeLiner allow you to connect to a variety of sources to import schedules to fully understand the effects of the schedule on the project model. Let's review the TimeLiner tool to learn how we can simulate the construction of our building project.

OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for instructions.

1. Launch your Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

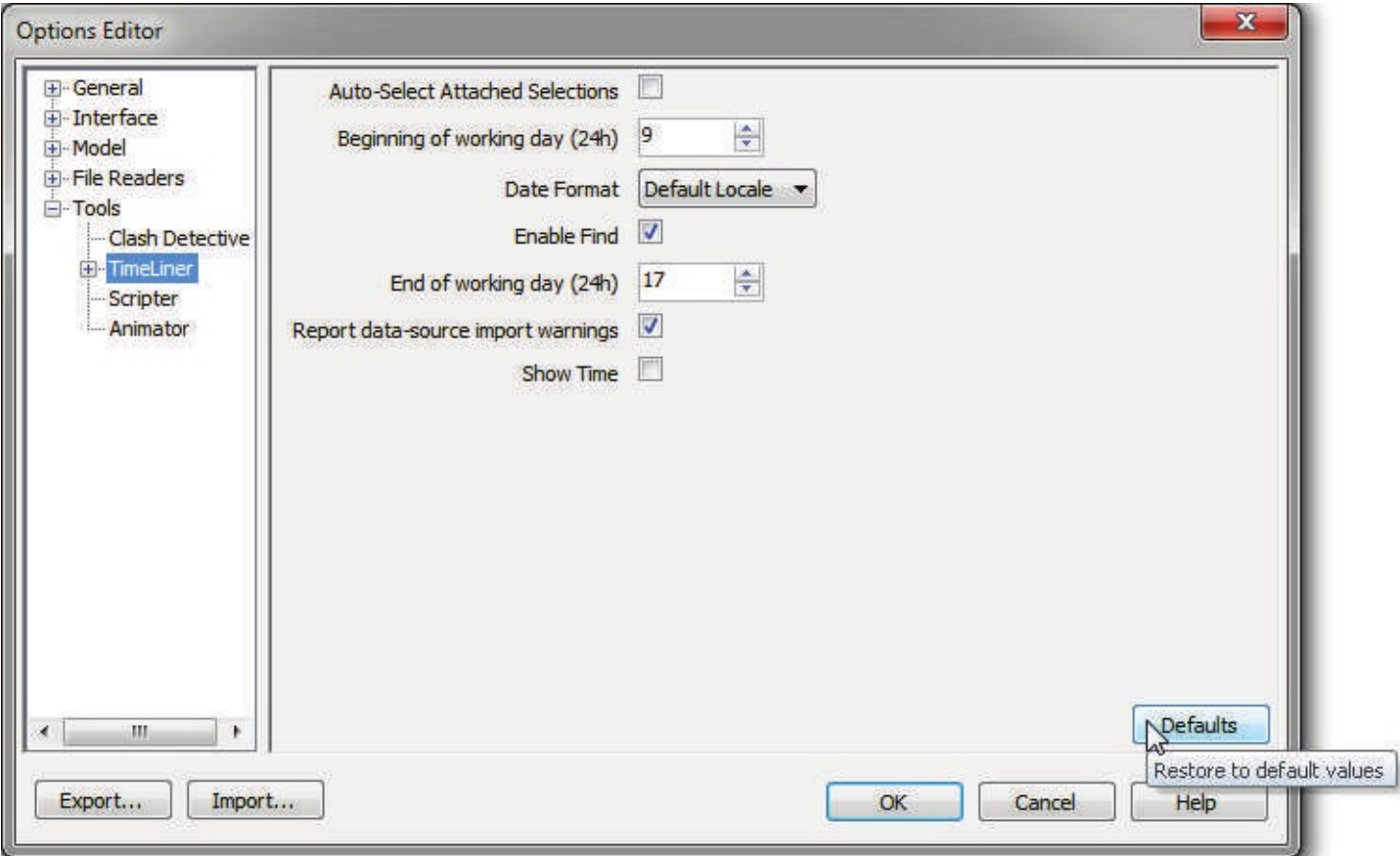
3. In the Open dialog, browse to the location where you installed the dataset files.

4. In the *Chapter09* folder, select the *09 Overall.nwf* file and then click Open.

Note: Use the Files of type: drop-down in the Open dialog to either display all the Navisworks files in a folder or isolate particular types of Navisworks files, in this case NWF files.

5. Above the ViewCube, click the home icon.

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You should now be looking towards the front of the building. Your project model consists of the site, architectural, structural, and mechanical components of the building project.

ADDING TASKS

In TimeLiner you work with Tasks. A Task is an event that can be simulated in the Navisworks project model. The TimeLiner tool allows various inputs when creating Tasks. In an earlier chapter, we learned the power of Search and Selection Sets. Search and Selection Sets can be used in the TimeLiner tool.

1. On the Home tab, on the Tools panel, click the TimeLiner button.

If necessary, dock TimeLiner at the bottom of the Scene View and then stretch the window to the point where you can view the tools in TimeLiner and a little of each pane.

2. Click the Tasks tab.

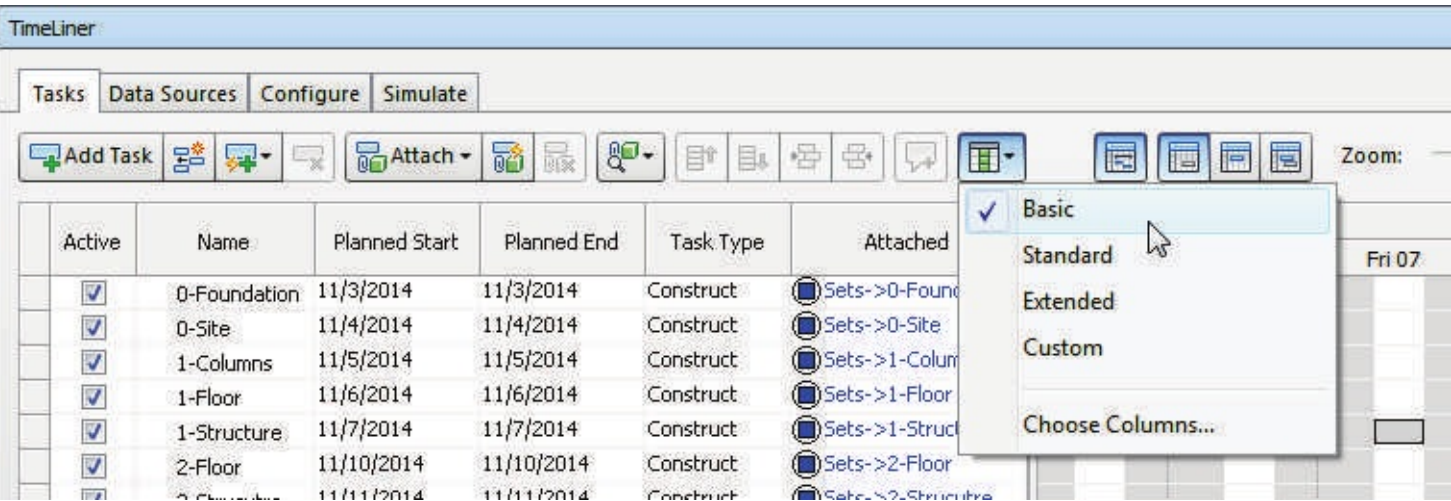
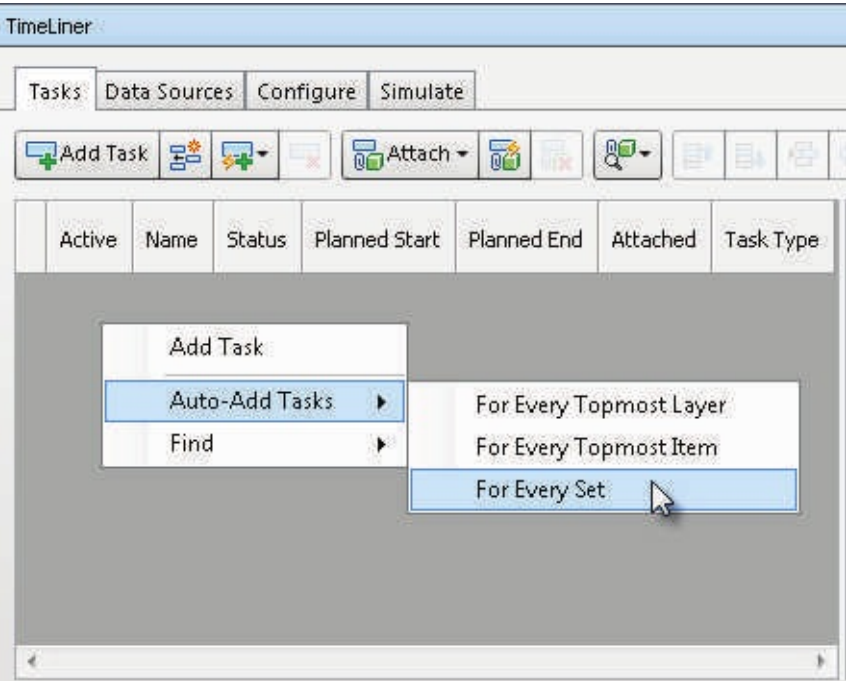
Before using TimeLiner, we should review the Global Settings for the TimeLiner tool. In this case, we'll make sure we are using the program defaults.

3. In Scene View, right-click and then choose: Global Settings.
4. In the "Options Editor" dialog, expand Tools and then select TimeLiner (see [Figure 9.1](#)).

FIGURE 9.1

Reset the TimeLiner settings to the defaults 5. In the bottom-right corner, click the Defaults button and then when prompted click Yes.

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6. Click OK to dismiss the dialog.

This resets the options for TimeLiner to the defaults. In some cases you may want to make adjustments. To learn more about the “Options Editor” visit the [“Global Settings”](#) topic in [Chapter 3](#). There are several ways to add items to the TimeLiner, but using Sets is a convenient way to set up our Tasks.

7. In the Task pane, right-click and choose: Auto-Add Tasks > For Every Set (see [Figure 9.2](#)).

FIGURE 9.2

Selection or Search Sets can be used in TimeLiner All of the pre-configured Selection Sets that include

the building components to be included in the TimeLiner simulation have now been populated in the Task pane.

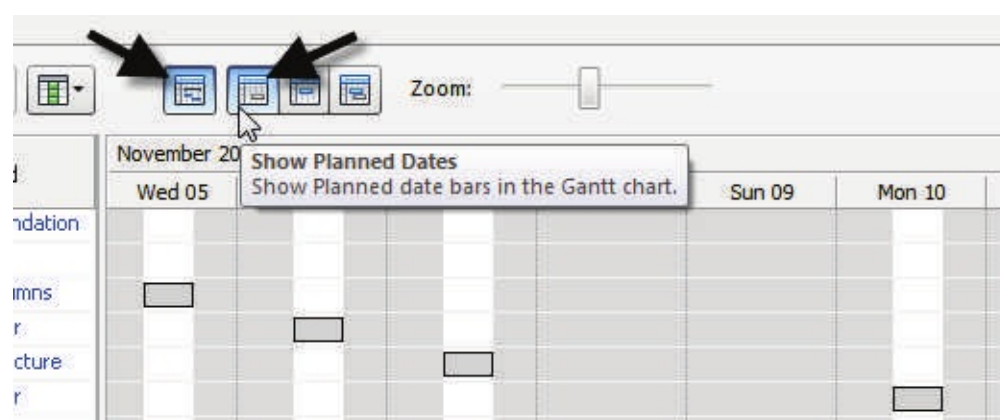
8. From the Columns drop-down, choose: Basic (see [Figure 9.3](#)).

FIGURE 9.3

Change the column display to Basic

9. Ensure the Gantt Chart is displayed on the right and then click the Show Planned Dates button (see [Figure 9.4](#)).

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FIGURE 9.4

Display the Gantt chart with planned dates on the right The Task pane now displays data for us to review. The Name of the Task, the Start and End time of the Task, and the Task Type has been populated automatically. In addition the Gantt chart reflects the Planned Dates for the Tasks in the Task list. You should also note that the Planned Start and Planned End dates were automatically pre-populated and reflect the normal “business day” (Monday through Friday). From here you can begin adjusting Days, Times, Tasks, and Selection Sets. For now we will leave the Days and Times alone but we need to make a few adjustments to the Task list.

10. In the Task list pane click 0-Site.

11. Hold down the CTRL key and also click:

1-Floor

1-Structure

2-Structure

- 3-Structure
- 4-Structure
- 5-Structure

- On the toolbar at the top of the Tasks tab, click the Move up icon.
- In the Task list pane click 1-Structure and then click the Move Up icon again (see [Figure 9.5](#)).

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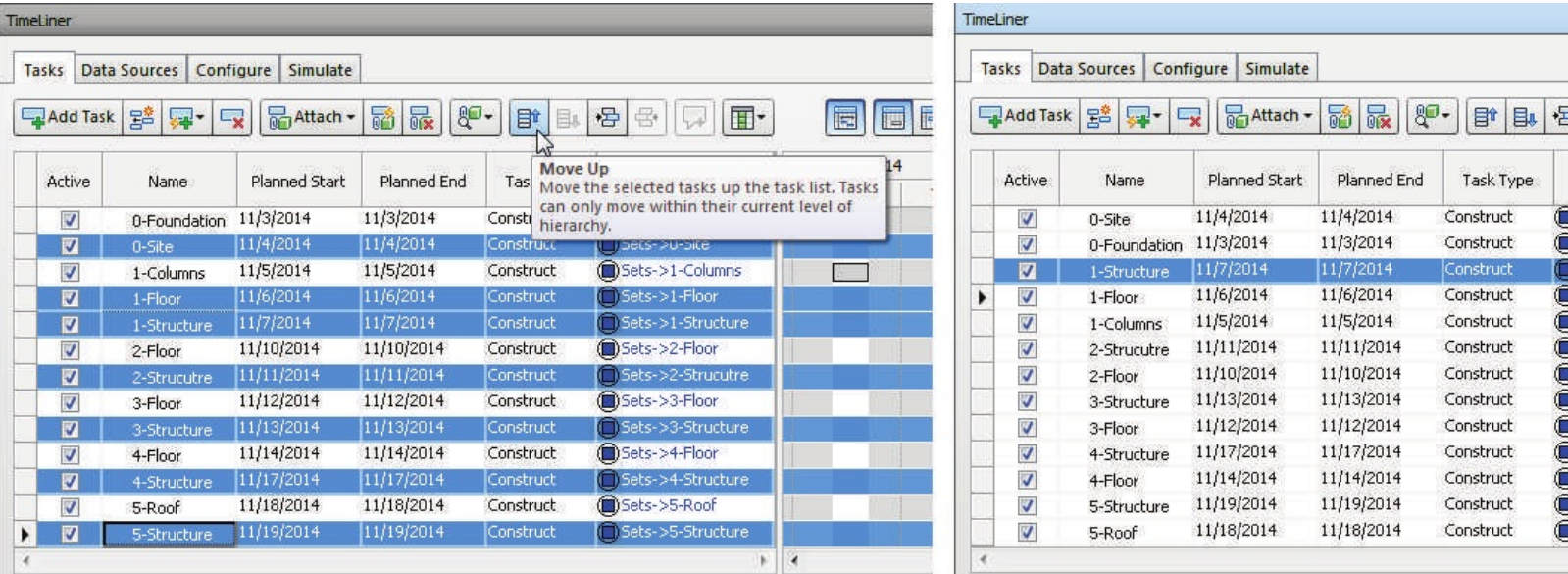


FIGURE 9.5

Reorder the items in the Task list using the Move up or Move down icons We have used pre-populated Selection Sets to populate the Task pane list and then we have reordered the Task to a more logical sequence.

DATA SOURCES

The Data Source tab allows you to add external schedules to the Navisworks project file.

Sources can be in many formats such as Microsoft Project or Primavera files. On the Data Sources tab, the Add button lists al of the file types that are supported. Once a source is loaded, there Delete and Refresh buttons will also become available. If you right-click in the Data Sources pane, you will get additional options on a right-click menu like options to rebuild, edit and rename.

For this exercise, we will not use an external data source file. Feel free to experiment with external data sources on your own later.

CONFIGURE

The Configure tab allows you to specify the appearance of items in the project model once the simulation begins. Color can be applied to the different configurations (i.e. phases of construction) in order to visually differentiate those items during the simulation.

Configurations can be named in any manner that you would like and you can add or delete configurations as needed. All configurations listed in the Configure pane will be available in Task Type drop-down in the Task list pane.

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1. Click the Configure tab.

The Configure tab is pre-populated with three configurations: Construct—This configuration is used for tasks that create new building components. By default the items are highlighted green at the start of the task and will use their Model Appearance at the completion of the task.

Demolish—This configuration is for task where the elements are to be demolished. By default the items are highlighted red at the start of the task and will be not be shown (hidden) at the completion of the task.

Temporary—This configuration is for all Tasks where the selected items are to be temporary. By default the items are highlighted yellow at the start of the task and will be not be shown (hidden) at the completion of the task.

The Name of the configuration can be modified by simply double-clicking the value in the Name column. This concept applies to each of the Appearance columns (i.e. Start Appearance, End Appearance, etc.) as well. Double-clicking any value in those columns launches the drop-down containing the available Appearances to apply to the configuration.

If you need to add a new configuration, use the Add button at the top of the list.

SIMULATE

The Simulate tab allows you to simulate the construction of the building based on the Tasks and schedule of the Tasks as defined in the TimeLiner too.

2. Click the Simulate tab.

The Simulate tab contains animation controls at the top and two panes: the Task pane and the Gantt chart pane below that.

The Task pane reflects the Task at hand during the Simulation and the Columns specific to the Tasks. The progress (percent complete) is also displayed in the Task pane for the current Task in the Simulation. The Columns in the Task pane can be modified by simply right-clicking a column and selecting Choose Columns. The “Simulate Column Chooser” dialog will appear and columns can be selected and moved accordingly. The available data for selection in this dialog is similar to the data available in the “Choose

dialog mentioned above. You should note that you do not need to open the “Simulate • Project Model Analysis •

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Column Chooser” dialog to move columns in the Task pane. To move a column in the Task pane click and drag the column to the location you desire.

Finally, the Gantt Chart pane displays bar charts representing the status of the Task. Tasks can run sequentially, in parallel, or overlap. The visible range of the Gantt Chart pane is controlled by the Interval Size setting found in the “Simulation Settings” dialog. For this example, we will not make any changes in the Simulate tab so, we are ready to simulate our building project.

3. In the Scene View, zoom to where you can visually see the building in an acceptable area.

4. On the Simulate tab, click the Play button in the Playback Controls.

The simulation should begin and the building components should be appearing as the Task is starting and ending. Feel free to click the Settings button to open the “Simulation Settings”

dialog and adjust the Playback Duration or other settings. You can also export the TimeLiner Simulation animation for viewing outside of Navisworks using the icon on the far right.

If you would like to save the current file to return to it later, you can save the project file as another name through the Application Menu with Save As. Otherwise in the next topic we’ll open a different file and close this one without saving.

USING AN EXTERNAL SCHEDULE

In this exercise, we are going to review a sample dataset provided by Autodesk with the Navisworks product. The sample dataset includes a schedule file that we can attach to the project file. We will use this to look at how we can attach the schedule to our tasks.

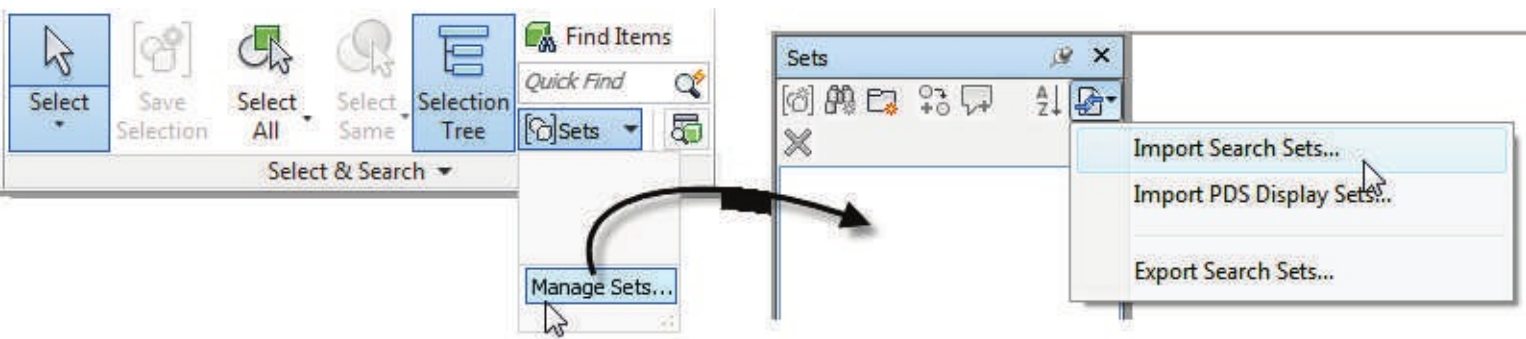
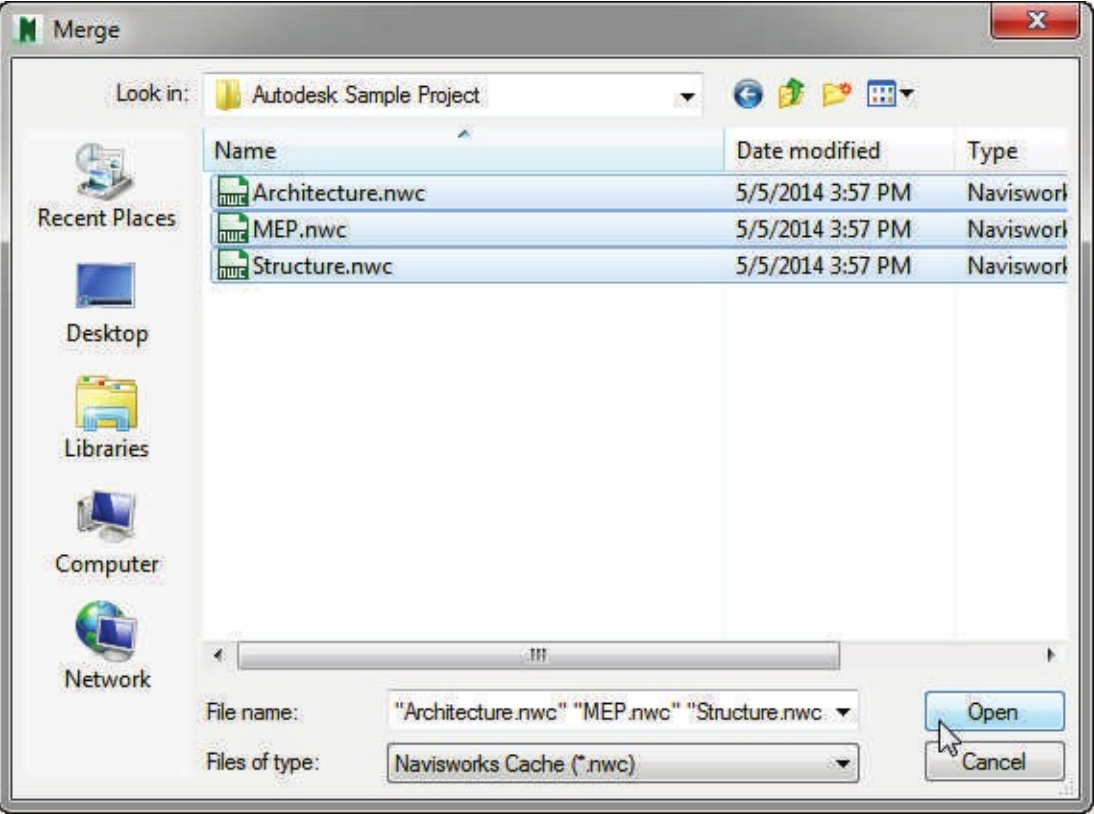
1. From the Application Menu choose: New.

2. If you did not save your project or save it as another name, when prompted to save your file click No.

3. On the Home tab, on the Project panel, click the Append drop-down and then click Merge.

4. In the Merge dialog, browse to the *Autodesk Sample Project* folder.

If necessary, change the Files of type to: Navisworks Cache (*.nwc).



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5. Hold down the CTRL key and select the *Architecture*, *MEP*, and *Structure* files and then click Open (see [Figure 9.6](#)).

FIGURE 9.6

Merge NWC files into a new file

- 6. Above the ViewCube, click the home icon.
- 7. Right-click in the Scene View and choose: Background.
- 8. In the Background Settings dialog, click the Color drop-down and then select the color White and then click OK.
- 9. On the Home tab, on the Select & Search panel, click the Sets drop-down and then choose: Manage Sets.

10. In the Sets window, click the Import/Export drop-down and then choose: Import Search Sets (see [Figure 9.7](#)).

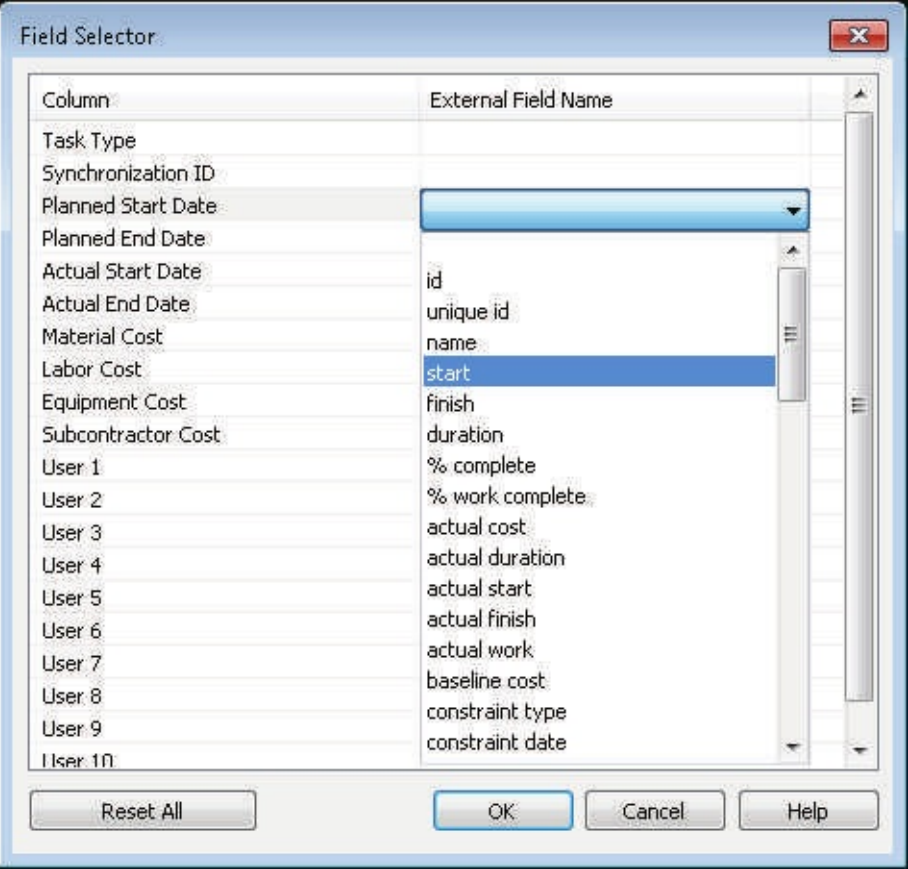
FIGURE 9.7

Import sets from an external file

11. Select the *Conference Center – Search Sets.xml* file and then click Open.

12. In TimeLiner, click the Data Sources tab.

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13. Click the Add drop-down button and then choose: Microsoft Project MPX.

14. Select the *Conference Center.mpx* file and then click Open.

At this point we can match fields between Navisworks and the external file. For example, in the first column we can match the Planned Start Date to the External Field Name: start.

Let’s begin to match fields between the two.

15. In the “Field Selector” dialog, click the box next to Planned Start Date, click the drop-down, and then choose: start (see [Figure 9.8](#)).

FIGURE 9.8

Fields between Navisworks and an external source and be matched 16. Click the box next to Planned End Date, click the drop-down, and then choose: finish.

17. Click the box next to Actual Start Date, and from drop-down, choose: actual start.

18. For Actual End Date, choose: actual finish and then click OK ([see Figure 9.9](#)).

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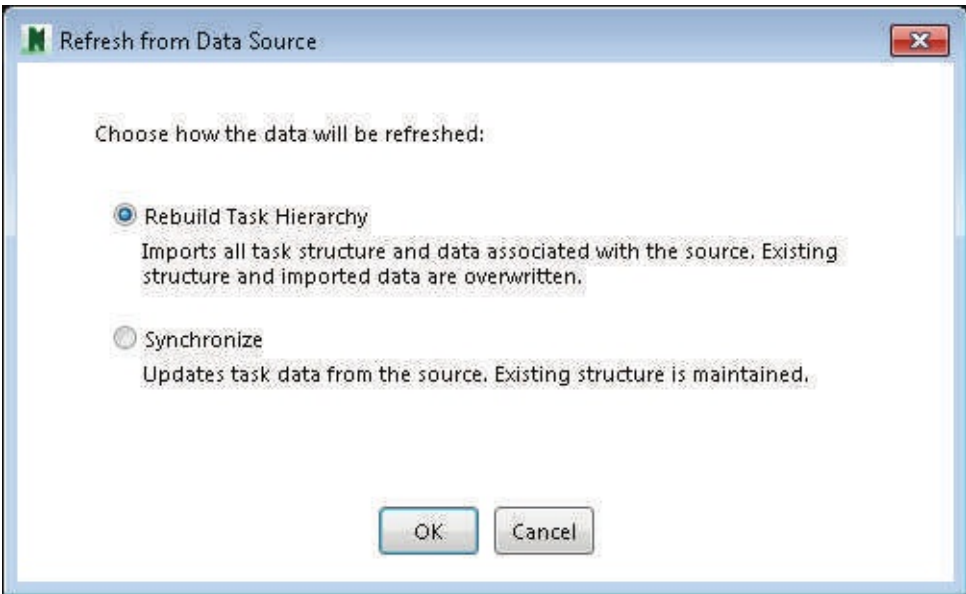
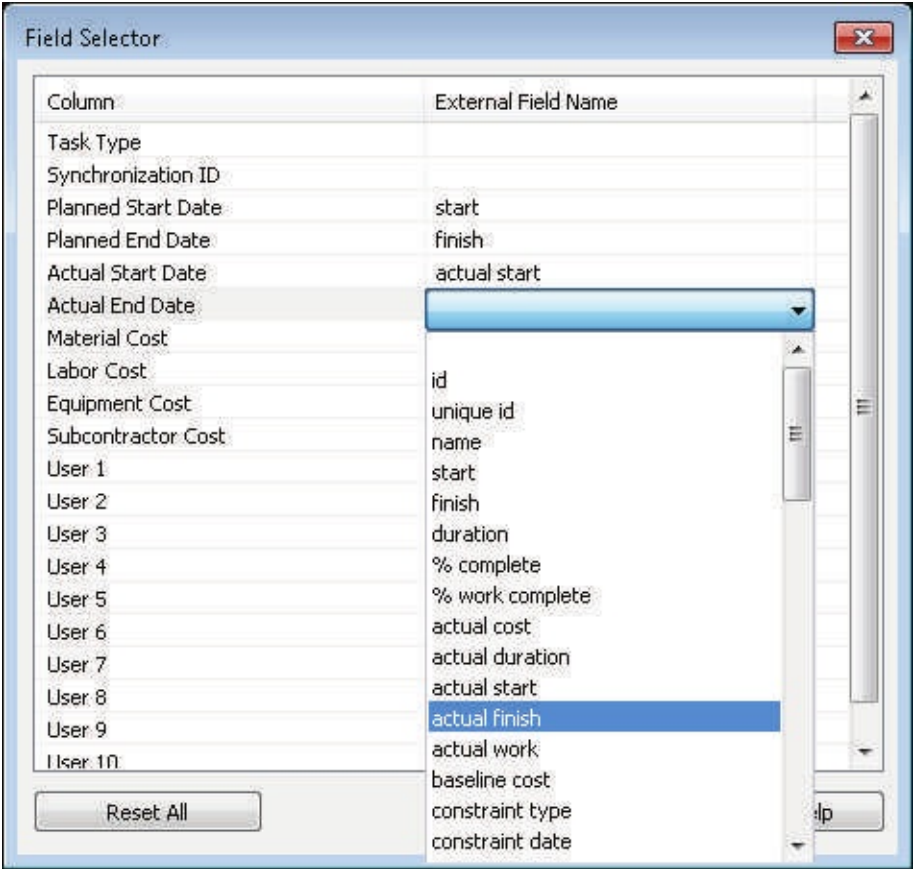


FIGURE 9.9

Fields between Navisworks and an external source and be matched 19. In TimeLiner, click the Tasks tab.

Notice that Tasks have not been populated. In this particular exercise we have a Microsoft Project file that contains all the project related tasks that we would like to simulate. Let’s review how we can populate the Task pane with the data from the Microsoft schedule file.

20. Click the Data Sources tab.

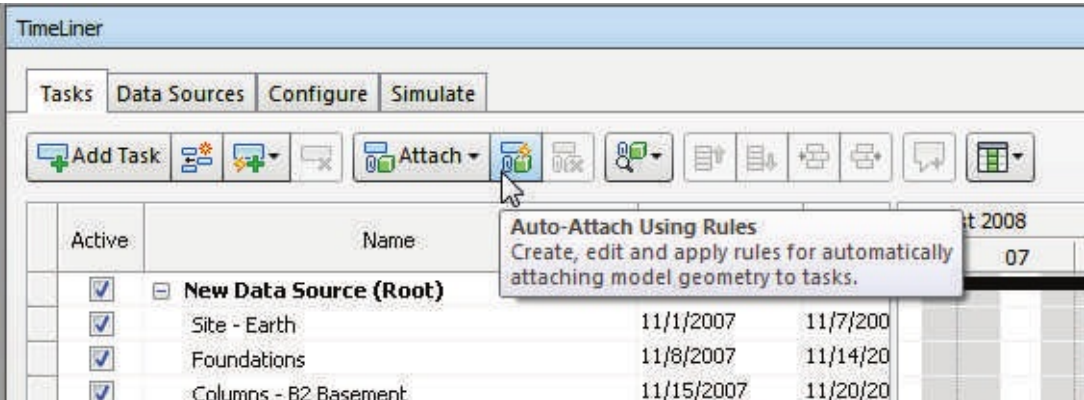
21. Click the Refresh drop-down button and then choose: All Data Sources.

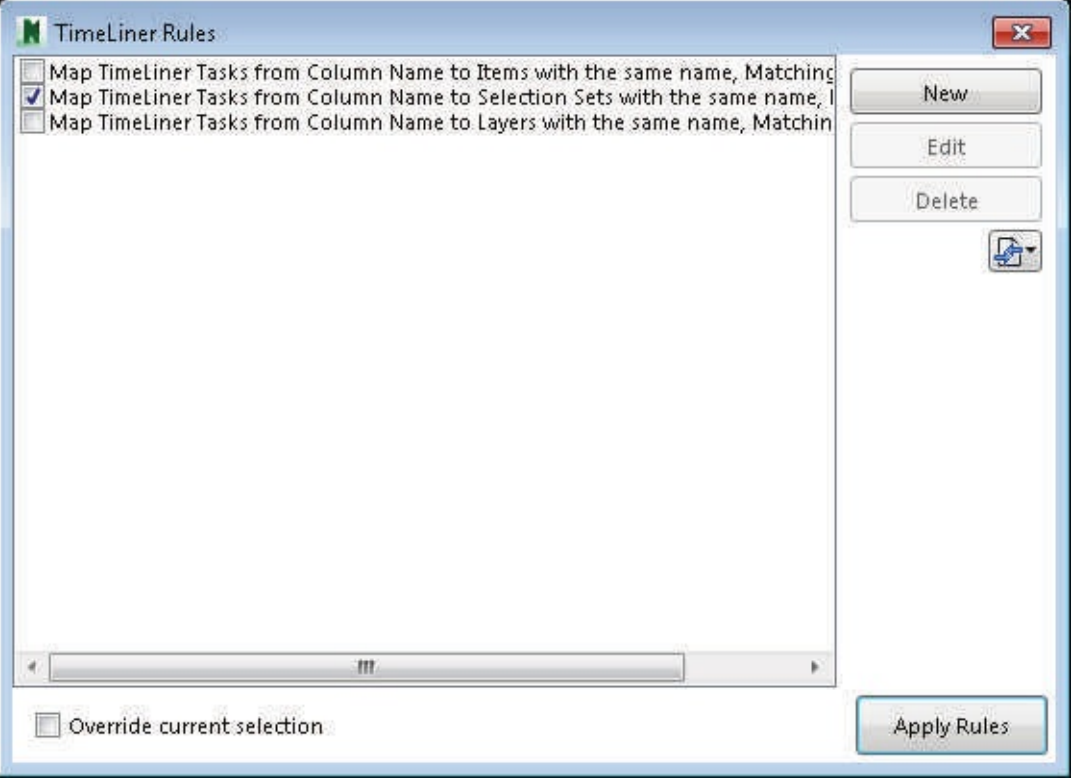
22. In the “Refresh from Data Source” dialog, ensure that the Rebuild Task Hierarchy radio button is selected and then click OK (see [Figure 9.10](#)).

FIGURE 9.10

Tasks in TimeLiner can be built or re-built from an external Data Source 23. Click the Tasks tab.

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Notice that Task list pane has been now been populated with the Tasks from the external Data Source. However, before we can Simulate the building construction there are a few more steps that we must complete.

24. On the Tasks tab toolbar, click the Auto-Attach Using Rules icon (see [Figure 9.11](#)).

FIGURE 9.11

Use rules to auto attach tasks

25. In the “TimeLiner Rules” dialog, check the second rule: “Map TimeLiner Tasks form Colum Name to Selection Sets with the same name, Matching case” and then click the Apply Rules button (see [Figure 9.12](#)).

FIGURE 9.12

Rules can be applied to TimeLiner

26. Close the “TimeLiner Rules” dialog.

You may need to scroll horizontally in the task pane to see the result, but once the Rules have been applied, they wil appear in the “Attached” Column next to each task (see [Figure 9.13](#)).

Tasks

Data Sources

Configure

Simulate

Add Task

Attach

Zoom:

Active	Name	Planned Start	Planned End	Task Type	Attached
<input checked="" type="checkbox"/>	<div>New Data Source (Root)</div>	11/1/2007	8/15/2008		
<input checked="" type="checkbox"/>	Site - Earth	11/1/2007	11/7/2007		Sets->Site - Earth
<input checked="" type="checkbox"/>	Foundations	11/8/2007	11/14/2007		Sets->Foundations
<input checked="" type="checkbox"/>	Columns - B2 Basement	11/15/2007	11/20/2007		Sets->Columns - B2 Basement
<input checked="" type="checkbox"/>	Structural Framing - Steel - B2 Basement	11/21/2007	11/27/2007		Sets->Structural Framing - Steel - B2 Basement
<input checked="" type="checkbox"/>	Floor Slabs - B2 Basement	11/28/2007	11/30/2007		Sets->Floor Slabs - B2 Basement

Tasks

Data Sources

Configure

Simulate

Add Task

Attach

Zoom:

Active	Name	Planned Start	Planned End	Task Type
<input checked="" type="checkbox"/>	<div>New Data Source (Root)</div>	11/1/2007	8/15/2008	<div></div>
<input checked="" type="checkbox"/>	Site - Earth	11/1/2007	11/7/2007	
<input checked="" type="checkbox"/>	Foundations	11/8/2007	11/14/2007	
<input checked="" type="checkbox"/>	Columns - B2 Basement	11/15/2007	11/20/2007	
<input checked="" type="checkbox"/>	Structural Framing - Steel - B2 Basement	11/21/2007	11/27/2007	

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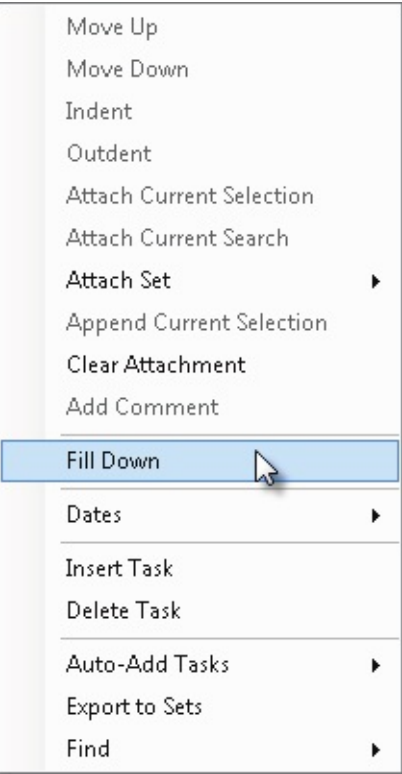
FIGURE 9.13

Rules can be applied to automatical y match Selection or Search Sets to Task so long as their names are similar One of the last things that we need to do before we can perform the simulation is to assign the Task Type to each task. Unfortunately, groups of Tasks in the task pane cannot be selected and edited altogether. However, there is a very quick and efficient way of doing this in lieu of selecting each individual task and changing the Task Type.

27. In the Task pane, select the New Data Source (Root) item at the top of the list.
28. In the Task Type column for this selection, click the drop-down, and then choose: Construct (see [Figure 9.14](#)).

FIGURE 9.14

- Task Types must be assigned before the building project can be simulated
29. Keep the New Data Source (Root) Task selected, scroll down to the end of the Task list in the Task pane, hold down the SHIFT key and select the very last Task in the list (Aluminum Crosshatch Shade Screens) to select all Tasks in the Task list in the Task pane.
30. Right-click in the Task pane and choose: Fill Down (see [Figure 9.15](#)).



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FIGURE 9.15

Using Fill Down you can copy the task type to all selected elements 31. Click the Simulate tab.

32. Click the Settings button.

33. In the “Simulation Settings” dialog, under Playback Duration (Seconds) input: **60** in the value box and then click OK.

34. In the Scene View, zoom to where you can visually see the building in an acceptable area.

35. Click Play in the Playback Controls.

The simulation should begin and the building components should be appearing as the Task is starting and ending. Feel free to open the Simulation Settings dialog and adjust the Playback Duration or export the TimeLiner Simulation animation for viewing.

As you can see, it takes a good deal of setup to create a proper simulation. However, since Navisworks is able to leverage scheduling tools widely used in the construction industry, such as Microsoft Project and Primavera, project setup can be greatly reduced in those cases where you have access to such schedules.

PREPARE TO CLOSE YOUR PROJECT FILE

If you would like to save the file you were working on herein to return to it later, you can save the project

file as another name through the Application Menu with Save As. Otherwise let's close the project file without saving.

36. From the Application Menu, choose: Exit Navisworks.

37. When prompted to save the changes to the project file, click No.

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QUICK REFERENCE FOR TIMELINER

The Timeliner panel contains several customizable settings. We explored a few in the tutorial above. Here is a complete list for your ongoing reference.

Timeliner Tasks tab:

Add Task—Adds a new Task at the bottom of the Task List in the Task pane.

Insert Task—Inserts a new Task above the Task currently selected in the Task pane.

Auto-Add Tasks—This drop-down will automatically adds Tasks to the Task pane based on the option selected.

For Every Topmost Layer—Click this option to create Tasks with the same name as each topmost layer in the Selection Tree.

For Every Topmost Item—Click this option to create Tasks with the same names as each topmost item in the Selection Tree.

For Every Set—Click this option to create Tasks with the same names as each Selection and Search Set in the Set window.

Delete Task—Deletes the Task that is currently selected in the Task pane.

Attach—This drop-down allows you to add Selections to a Task.

Attach Current Selection—Click this option to attach the currently selected items in the Scene View to the selected Task in the Task pane.

Attach Current Search—Click this option to attach all items from the current Search to the selected Task in the Task pane.

Append Current Selection—Click this option to append the currently selected items in the Scene View to the Task currently selected in the Task pane.

Auto-Attach Using Rules—Opens the TimeLiner Rules dialog where Rules can be created and applied for automatically attaching geometry to Tasks. The concept of Rules was previously discussed in [Chapter](#)

Clear Attachment—Detaches the model geometry from the selected Task(s) in the Task pane.

Find Items—This drop-down allows you to Find Items in the Task Schedule based on search criteria. This option can be turned off through the TimeLiner Global Settings. Global Settings and File Options were explored in [Chapter 3](#).

Attached Items—Click this option to select any item(s) in the Scene View this is attached to a Task.

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Contained Items—Click this option to select any item(s) in the Scene View that are either attached to a Task or contained within any other item attached to a Task.

Unattached / Uncontained Items—Click this option to select any item(s) that are not attached to a Task or contained within any other item attached to a Task.

Note: A Contained item is a child of another item. For example, geometry of a Group is considered a contained item. That Group can be attached to a Task although the geometry is not directly attached but is contained within an item that is attached.

Items Attached to Multiple Tasks—Click this option to select any item(s) in the Scene View that are attached to more than one Task.

Items Contained in Multiple Tasks—Click this option to select any item(s) in the Scene View that are attached to, or contained within, any other item that is attached to more than one Task.

Items Attached to Overlapping Tasks—Click this option to select any item(s) in the Scene View that are attached to more than one task and the Task durations overlap.

Items Contained in Overlapping Tasks—Click this option to select any item(s) in the Scene View that are either attached to a Task or contained within any other item attached to a Task and the Task durations overlap.

Move Up—Allows you to move the currently selected Task in the Task pane up the Task list.

Move Down—Allows you to move the currently selected Task in the Task pane down the Task list.

Indent—Indents the currently selected Task by one level in the Task list hierarchy.

Outdent—Outdents the currently selected Task by one level in the Task list hierarchy.

Add Comment—Adds a comment to the Task. The concept of Comments was previously discussed in Measure and Redlines chapter. If you have not had the opportunity the review the discussion on Comments in that chapter please do so now.

Columns—This drop-down allows you to define the Columns that will be displayed in the Task pane.

Basic—The following columns are displayed in the Task pane: Active, Name, Planned Start, Planned End, Task Type, and Attached.

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Standard—The following columns are displayed in the Task pane: Active, Name, Status, Planned Start, Planned End, Actual Start, Actual End, Task Type, Attached, and Total Cost.

Extended— The following columns are displayed in the Task pane: Active, Name, Status, Planned Start, Planned End, Actual Start, Actual End, Task Type, Attached, Material Cost, Labor Cost, Equipment Cost, Subcontractor Cost, Total Cost, Script, Animation, and Animation Behavior.

Custom— The following columns are displayed in the Task pane: Active, Name, Status, Planned Start, Planned End, Attached, and Task Type.

Choose Columns...—Opens the Choose TimeLiner Columns dialog to allow selection of the items you would like displayed in the TimeLiner Task pane.

Show or hide the Gantt Chart—This option allows you to show or hide the Gantt Chart pane.

Show Planned Dates—This option allows you to show Planned Dates in the Gantt Chart pane.

Show Actual Dates—This option allows you to show the Actual Dates in the Gantt Chart pane.

Show Planned vs Actual Dates—This option allows you to show the Planned Dates versus the Actual Dates in the Gantt Chart pane.

Zoom slider—The slider allows you to adjust the time period displayed in the Gantt Chart pane. With the slider in the left most position selects the largest time frame while the slider in the right most position selects the smallest time frame.

Filter by Status—This drop-down allows you to filter Tasks based on their Start and/or Finish status. When a filter is applied to the Gantt Chart the Task is temporarily hidden from the Task and Gantt Chart panes but not removed from TimeLiner.

Export To Sets—This options allows you to create Selection Sets based on the TimeLiner hierarchy.

Export the schedule.—This drop-down allows you to export a TimeLiner schedule.

Export CSV—Click this option to export the TimeLiner schedule as a Comma-separated values file.

Export MS Project XML...—Click this option to export the TimeLiner schedule as a Microsoft Project XML file.

Timeliner Simulate tab:

Playback Controls—The Playback Controls allow you to Rewind, Step Back, Play Backwards, Stop, Pause, Play, Step Forward, or Forward the simulation.

Simulation Slider— The slider allows you to adjust to move forwards or backwards in the Simulation. The beginning of the simulation is in at left most position and the end of the simulation is at the right most position. You should that the date and time for the beginning and end of the simulation appears below the slider. As the slider moves or is adjusted the dates in the Gantt Chart, if active, reflect the corresponding date and time.

Export Animation—Click this option to open the Export Animation dialog. The Export Animation dialog was previously discussed in [Chapter 5](#).

Date—Directly below the Playback Controls is the Date value box. You can manually enter a date or click the Date drop-down to select a specific date.

Once a date has been provided the simulation will reflect the construction progress of the building for that particular date.

Settings—Clicking this option opens the Simulation Settings dialog. The following is available in the dialog:

Start / End Dates—This area allows you to override the Start and End dates of the simulation.

Interval Size—This area allows you to set the size of the interval when stepping through the simulation using the Playback Controls.

The Interval Size can be set as a percentage of the overall simulation, or to a number of days or hours, etc. You can also select to Show all Tasks in the interval. This allows you to see pending Tasks during the interval time.

Playback Duration—This area defines the overall Playback Duration, in seconds, for the complete Simulation.

Overlay Text—This area defines the information displayed in the Overlay Text (i.e. Date/Time, Cost, etc.) and the location of the Overlay Text in Scene View.

Animation—This drop-down allows you to link the schedule to a Viewpoint.

View—This area allows you to select how to depict the items shown in the Task list (i.e. Planned, Actual, etc.). Here are the options for selection:

Planned—Selecting this radio button will simulate only the Planned Tasks (i.e. tasks with Planned Start and End dates).

Planned (Actual Differences)—Selecting this radio button will simulate the Actual schedule against the Planned schedule. The • Section III •

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simulation will only highlight items attached to Tasks over the Planned range (i.e. Planned Start and End).

Planned against Actual—Selecting this radio button will simulate the Actual schedule against the Planned schedule. The simulation will only highlight items attached to Task over the Planned and Actual range (i.e. the earliest Actual and Planned Start and the latest Actual and Planned End).

Actual—Selecting this radio button will simulate only the Actual Tasks (i.e. tasks with Actual Start and End dates).

Actual (Planned Differences)—Selecting this radio button will simulate the Actual schedule against the Planned schedule. The simulation will only highlight items attached to Tasks over the Actual range (i.e. Actual Start and End).

SUMMARY

The TimeLiner tool can use selection sets to create a simulation of building construction. In addition, leveraging an external schedule and linking it to a project makes the creation of a simulation more streamlined.

Selection and/or Search Sets can be used to create Tasks in TimeLiner in an effort to create a building simulation.

External sources can be added to the project file to create Tasks and those Tasks can automatically have Selection and/or Search sets applied to them through Rules within the TimeLiner tool.

Task must have the appropriate Task Type assigned in order for the items associated with the Task appear in the simulation correctly.

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Chapter 10

Quantification

INTRODUCTION

The Quantification tool in Navisworks allows you determine quantities of items in a project model. This can be done with or without property data. The Quantification tool gives you the ability to make material estimates, measure areas, and count building components.

Having that ability at your fingertips can help expedite cost estimation and material procurement tasks.

OBJECTIVES

To acquaint you with the Quantification tool that allows you to identify, categorize, and quantify building components to help you spend less time making material estimates.

Topics we will explore include:

- Creating a project takeoff.
- Selecting individual or multiple Items for the takeoff.
- Using Search Sets to create a project takeoff.

QUANTIFICATION

Navisworks provides the ability to quantify building components in a project model. The components can have property data associated with them or not. Having property data associated with the building component gives you the ability to mine the data to determine quantities faster. The quantities can then be stored in the Workbook and that Workbook can be updated if the project model is updated. Not all building components are modeled (3D).

Some might exist in 2D (lines, arcs, and circles). Regardless the physical characteristics of the building component, the Quantification tool will still allow you to quantify the building component. The Quantification tool allows you to determine quantities of building components faster than traditional methods thus allowing you to spend more analyzing your

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project for constructability. Let's review the Quantification tool to learn how we can determine quantities in the project model.

OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this

book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for instructions.

1. Launch your Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

3. In the Open dialog, browse to the location where you installed the dataset files.

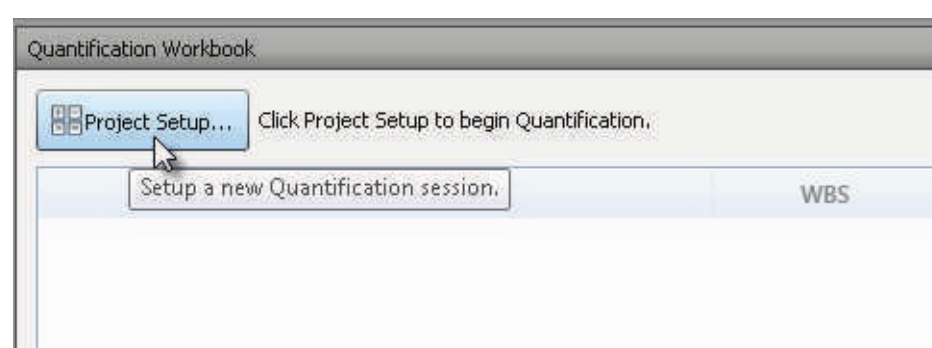
4. In the *Chapter10* folder, select the *10 Overall.nwf* file and then click Open.

Note: Use the Files of type: drop-down in the Open dialog to either display all the Navisworks files in a folder or isolate particular types of Navisworks files, in this case NWF files.

5. Above the ViewCube, click the home icon.

You should now be looking towards the front of the building. Your project model should consist of architectural, structural, and mechanical building components. The project site is not included in this file.

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QUANTIFICATION WORKBOOK

One of the first things that you must do before using the Quantification tool is to create a Quantification

Workbook. This is where you will perform your takeoff, either Model or Virtual. The Workbook will only need to be created once for the project file. When setting up the Workbook you can use predefined Catalogs or import a Catalog you have configured with your standards. An imported Catalog might contain the Items and Resources used in your projects. The units of measurement (Imperial or Metric) will also need to be established when the Workbook is setup. Units of measurement can also be assigned to individual Takeoff Property as the Workbook is being configured. In addition, both units of measurement can be displayed for the Takeoff Property, if needed. After the initial configuration is complete the Workbook will populate with the Items from the loaded Catalog. Let's setup our Quantification Workbook now.

1. On the Home tab, On the Tools panel, click the Quantification button (see [Figure 10.2](#)).

FIGURE 10.1

The Quantification tool on the Home tab When initially opened for the first time, the Workbook is empty. Let's populate the Workbook with Items from a predefined Catalog.

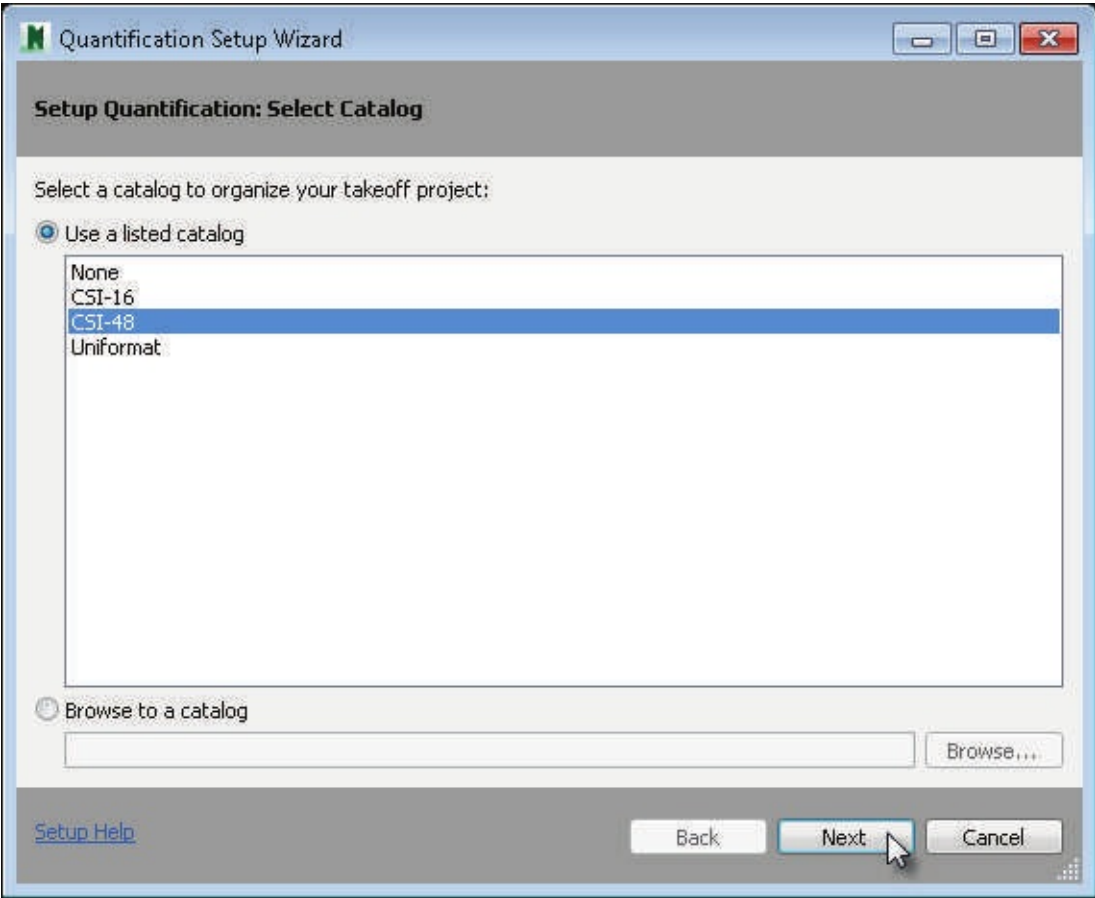
If necessary, pin the Quantification Workbook window open and dock it to the bottom of the screen.

2. In the Quantification Workbook window, click Project Setup (see [Figure 10.3](#)).

FIGURE 10.2

Starting a new Workbook

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At this point, you might be prompted to view getting started tutorials from Autodesk. We will set aside this prompt for now.

3. In the “Quantification Getting Started” dialog, click the Remind Me Later button.

Now we need to select a Catalog for our Workbook. We can use a predefined catalog or we can browse to a Catalog that we have created and import it into our Workbook. Since we do not have a Catalog to import for this exercise we will select a predefined Catalog from the list.

4. In the “Quantification Setup Wizard” dialog, select CSI-48 and then click Next ([see Figure 10.4](#)).

FIGURE 10.3

Selecting the appropriate Catalog for the Workbook Our next step is to select the correct unit of measurement. Here we can choose Imperial or Metric or another “as-is” value.

5. In the “Quantification Setup Wizard” dialog, choose: Imperial and then click Next ([see Figure 10.5](#)).

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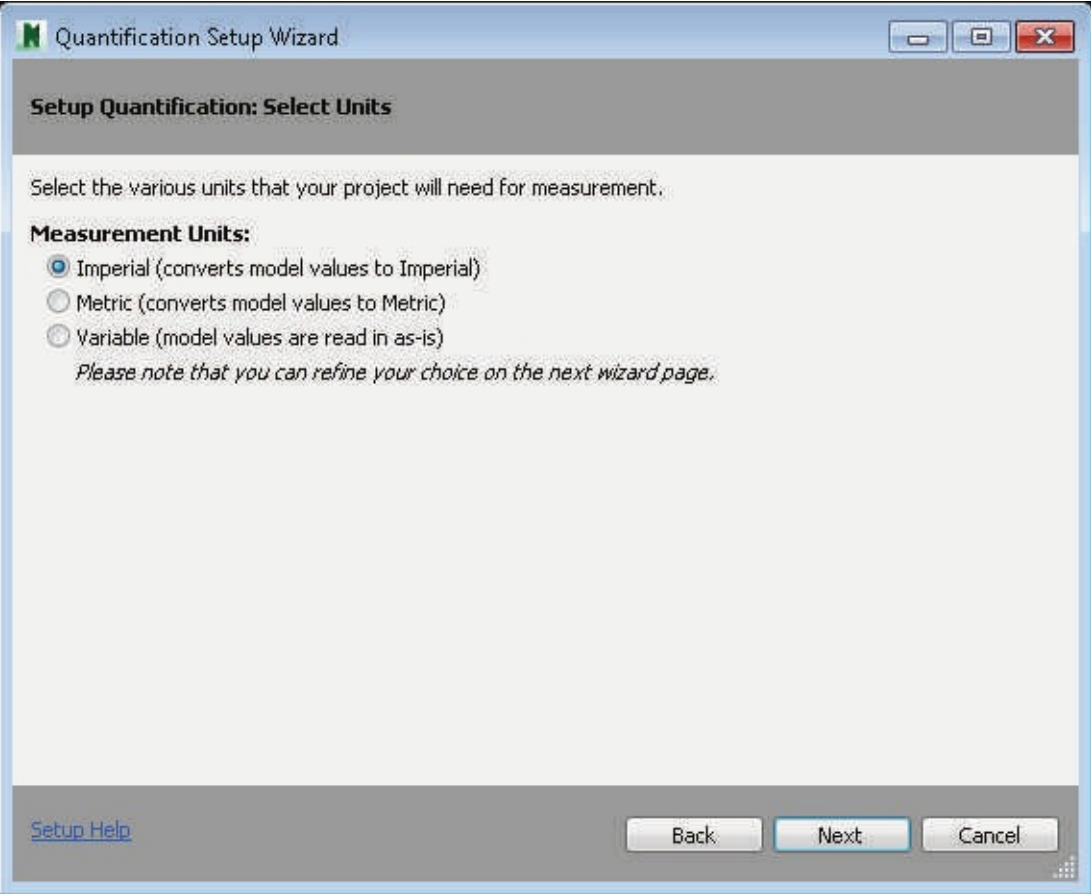


FIGURE 10.4

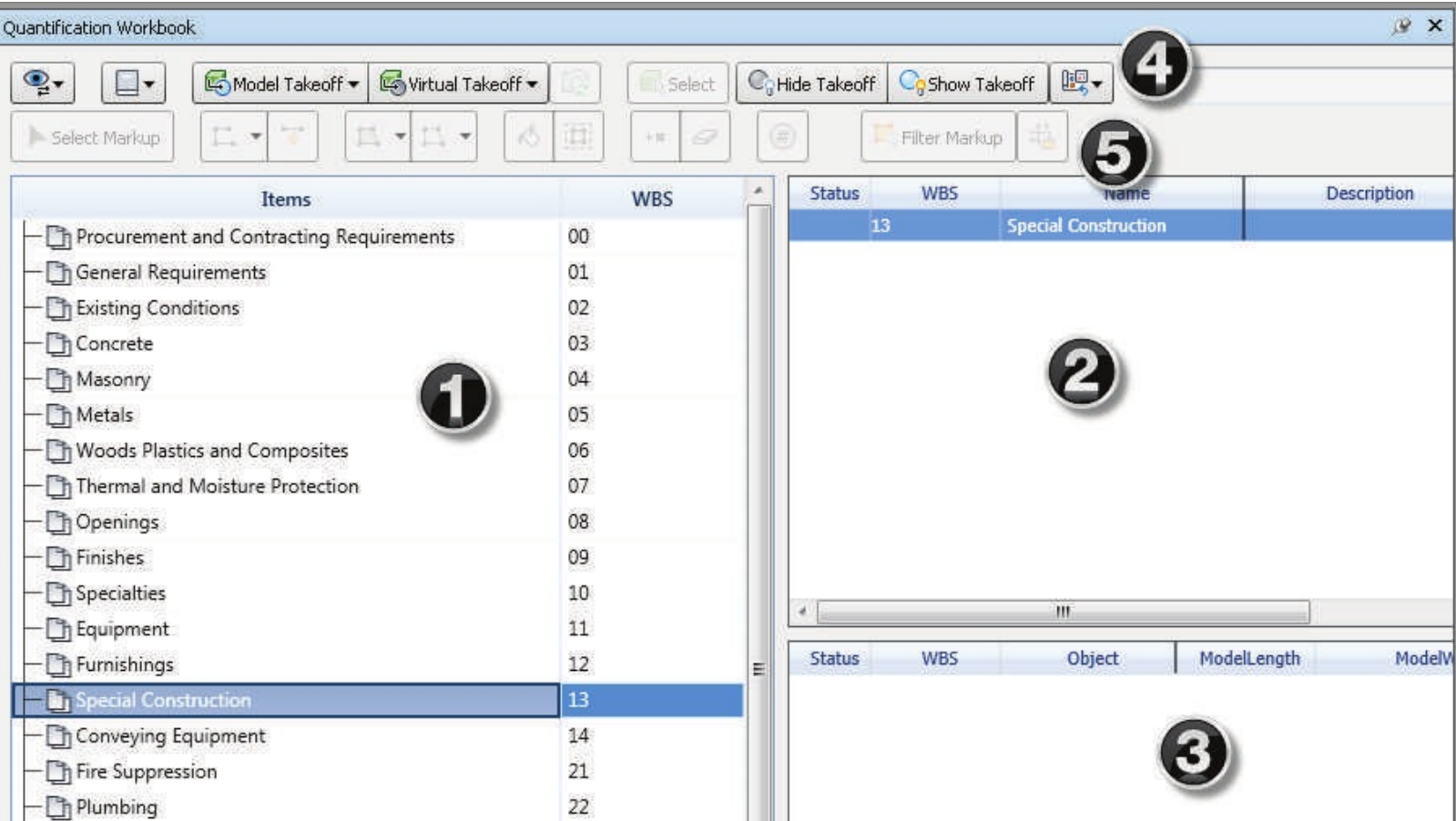
Selecting the appropriate units of measurement for the Workbook After defining the initial units of measurement for the Workbook we can further define the units of measurement for individual takeoff properties or show both Imperial and Metric units for each takeoff property (see Figure 10.6).

FIGURE 10.5

Selecting the appropriate units of measurement for the Workbook For the purposes of this exercise we will not modify any of the individual Takeoff Property settings.

6. In the “Quantification Setup Wizard” dialog, click Next.

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Our Workbook has now been setup and it will be populated with the Items from the Catalog we selected.

7. In the “Quantification Setup Wizard” dialog, click the Finish button.

The Workbook can be broken down into five distinct areas (see Figure 10.6): 1. The Navigation pane.

2. The Rollup pane.

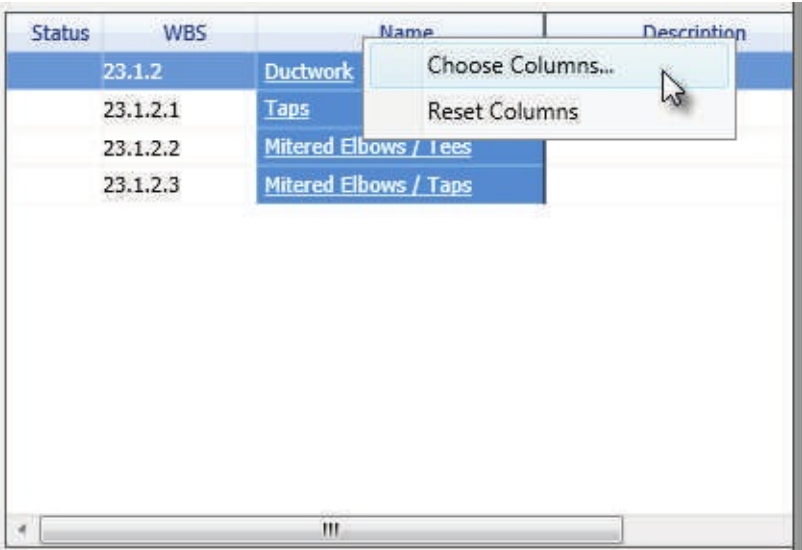
3. The Takeoff pane.

- 4. Quantification Toolbar.
- 5. 2D Takeoff Toolbar.

FIGURE 10.6

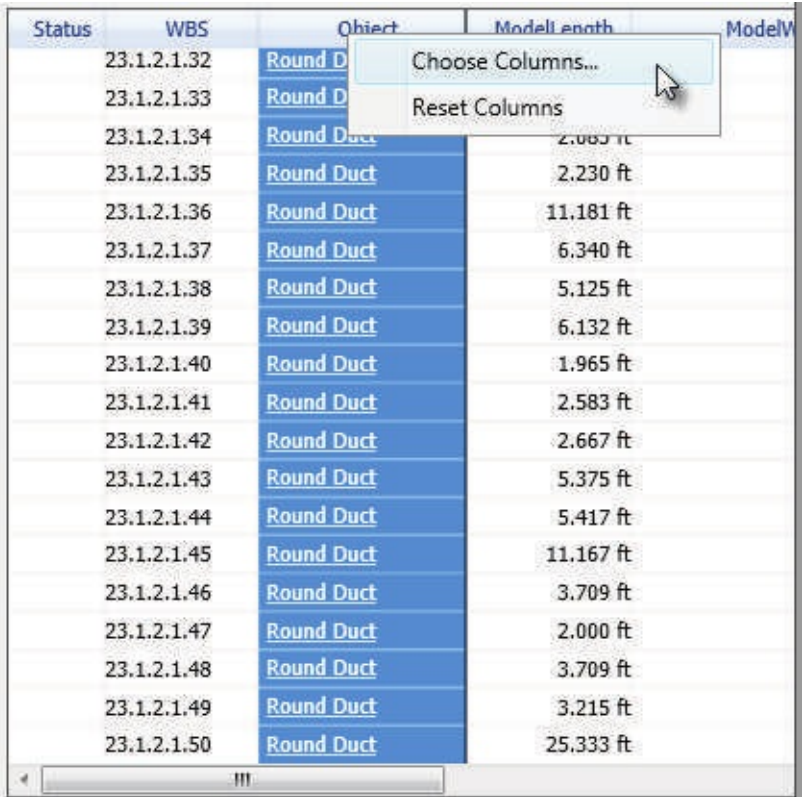
The Quantification Workbook initially populated with Items Before we continue, a little more information on each of the panes is in order: Navigation pane—This pane contains the list of Items and WBS (Workbook Breakdown Structure) codes. In our example, the WBS codes represent the CSI specification sections from the Catalog we used to populate our Workbook.

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This screenshot shows a table with four columns: Status, WBS, Name, and Description. The table contains four rows of data. A context menu is open over the 'Name' column, showing 'Choose Columns...' and 'Reset Columns' options. The 'Name' column is highlighted in blue.

Status	WBS	Name	Description
23.1.2		Ductwork	
23.1.2.1		Taps	
23.1.2.2		Mitered Elbows / Tees	
23.1.2.3		Mitered Elbows / Taps	



This screenshot shows a table with four columns: Status, WBS, Object, and Model Length. The table contains 20 rows of data. A context menu is open over the 'Object' column, showing 'Choose Columns...' and 'Reset Columns' options. The 'Object' column is highlighted in blue.

Status	WBS	Object	Model Length
23.1.2.1.32		Round Duct	
23.1.2.1.33		Round Duct	
23.1.2.1.34		Round Duct	2.003 ft
23.1.2.1.35		Round Duct	2.230 ft
23.1.2.1.36		Round Duct	11.181 ft
23.1.2.1.37		Round Duct	6.340 ft
23.1.2.1.38		Round Duct	5.125 ft
23.1.2.1.39		Round Duct	6.132 ft
23.1.2.1.40		Round Duct	1.965 ft
23.1.2.1.41		Round Duct	2.583 ft
23.1.2.1.42		Round Duct	2.667 ft
23.1.2.1.43		Round Duct	5.375 ft
23.1.2.1.44		Round Duct	5.417 ft
23.1.2.1.45		Round Duct	11.167 ft
23.1.2.1.46		Round Duct	3.709 ft
23.1.2.1.47		Round Duct	2.000 ft
23.1.2.1.48		Round Duct	3.709 ft
23.1.2.1.49		Round Duct	3.215 ft
23.1.2.1.50		Round Duct	25.333 ft

Rollup pane—This pane displays the *summary* of your takeoffs. When selecting an Item in the Navigation pane a summary of the Item will be displayed in the Roll up pane. When selecting an Item in the Rollup pane all the associated Items will also be highlighted in the Selection Tree as well.

When you right-click on a column header in the Rollup pane you can either choose the columns you wish to display or reset the columns to a default display (see [Figure 10.7](#)).

FIGURE 10.7

The Rol up pane inside the Quantification Workbook Takeoff pane—This pane displays *all* the takeoffs. When selecting an Item in the Navigation pane all Items will be displayed in the Roll up pane. When selecting an Item in the Takeoff pane the associated Item will also be highlighted in The Selection Tree as well. When you right-click on a column header in the Rollup pane you can either choose the columns you wish to display or reset the columns to a default display (see [Figure 10.8](#)).

FIGURE 10.8

The Takeoff pane inside the Quantification Workbook Now that we have an understanding of the three Workbook panes, let’s review the tools on the Toolbar (see [Figure 10.9](#)).

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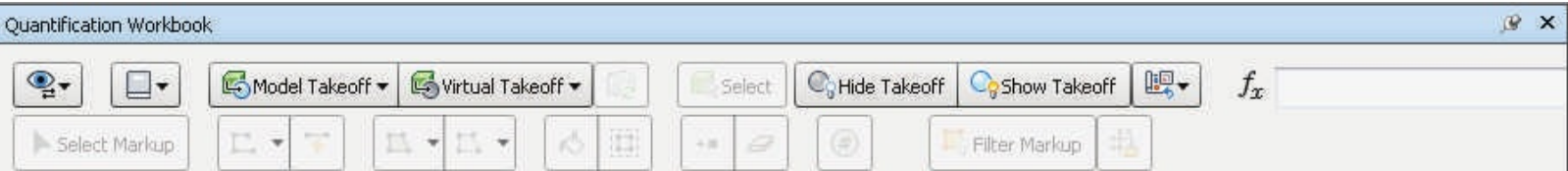


FIGURE 10.9

The Quantification Workbook Toolbar Switch between Item View and Resource View.—This drop-down allows you to toggle between the Item Catalog View or the Resource Catalog View in the Navigation Pane.

Show and hide the Item and Resource Catalogs.—This drop-down allows you to open either the Item Catalog or Resource Catalog dockable window.

Item Catalog—The Item Catalog is the organizational structure for your takeoff. The Item Catalog is where a New Group or New Item can be created to be included in the Quantification Workbook. A name and WBS

structure number can be applied to the item when it is created. In addition, Color, Calculations, and Map Rules can also be applied.

Resource Catalog—The Resource Catalog is the organizational structure where resources can be associated to items, such as the materials that make up the item. A New Group or New Resource can be created to be included in the Quantification Workbook. A name and Resource structure number can be applied to the item when it is created. In addition, Calculations can also be applied to the Resource.

Model Takeoff—Use this drop-down to use the Properties of the Item to create the takeoff.

Virtual Takeoff—Use this drop-down to select an Item that has geometry but no Properties or to select an Item that does not have any geometry or Properties. Missing Properties can occur when the Properties from the authoring software were not included or saved with the model.

Add a viewpoint to the takeoff, or update an existing viewpoint—Include a Viewpoint of an area or position in the Scene View that you would like to associate with the takeoff.

Select—Select model Items that correspond to the takeoff.

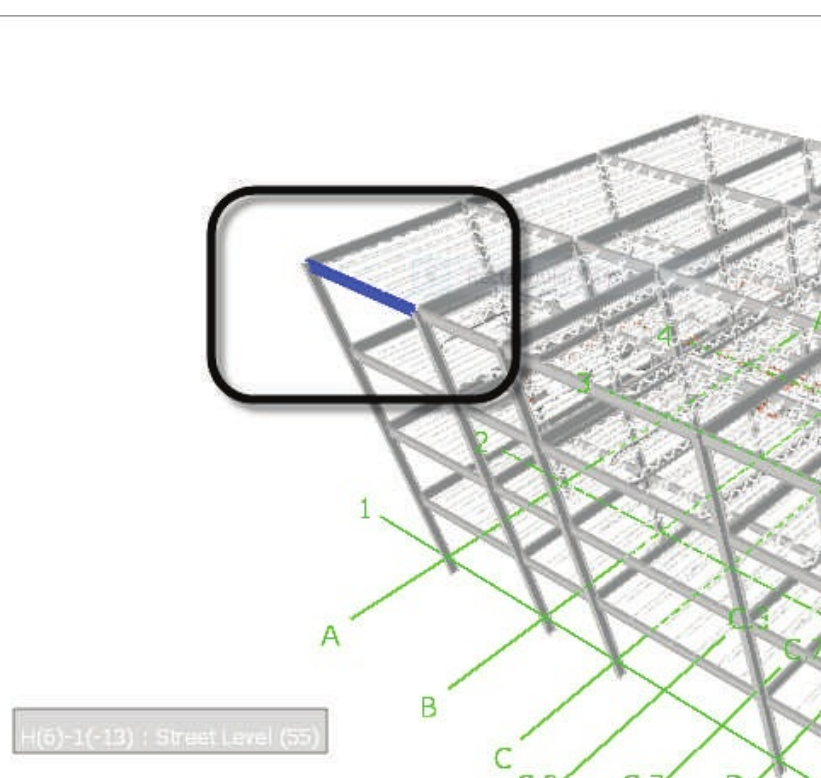
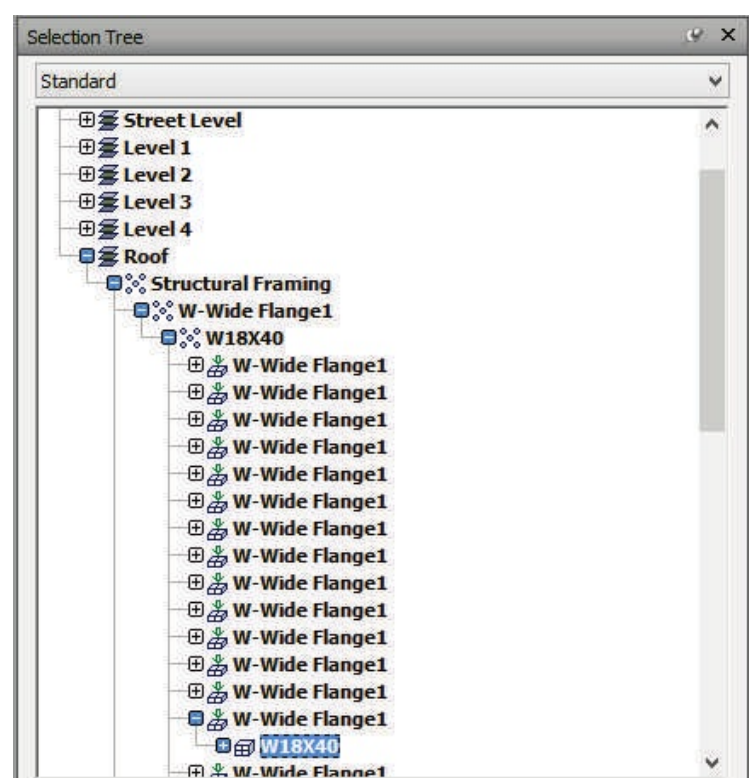
Hide Takeoff—Hides all the model Items that have been taken off.

Show Takeoff—Displays only the model Items that have been taken off and hides all other model Items.

Control the appearance of the model items—Use this drop-down to either Reapply Quantification Appearance or Reapply Original Model Appearance.

Change Analysis—Use this drop-down to either Analyze Changes or Clear Analysis Results. Change Analysis allows you to compare changes to Properties between model versions.

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Update—Use this drop-down to update the selected row, update the selected Items from the model, remove overrides from the selected Items, or to delete the selected takeoff.

Import/export Catalogs and export Quantities— Use this drop-down to import a catalog, export a catalog to an XML file, export quantities to and Excel file, or to export the quantities to an Excel file.

With our basic understanding of the Quantification Workbook, we are now ready to perform our takeoff. There are several ways that a takeoff can be performed. Single Items or multiple Items can be selected in order to begin creating the takeoff. Let's explore a few options.

Verify that the Selection Tree is open. If it is not, on the Home tab, on the Select & Search panel, click the Selection Tree button.

8. Dock and pin the Selection Tree to the left side of the screen.

SINGLE ITEM TAKEOFF

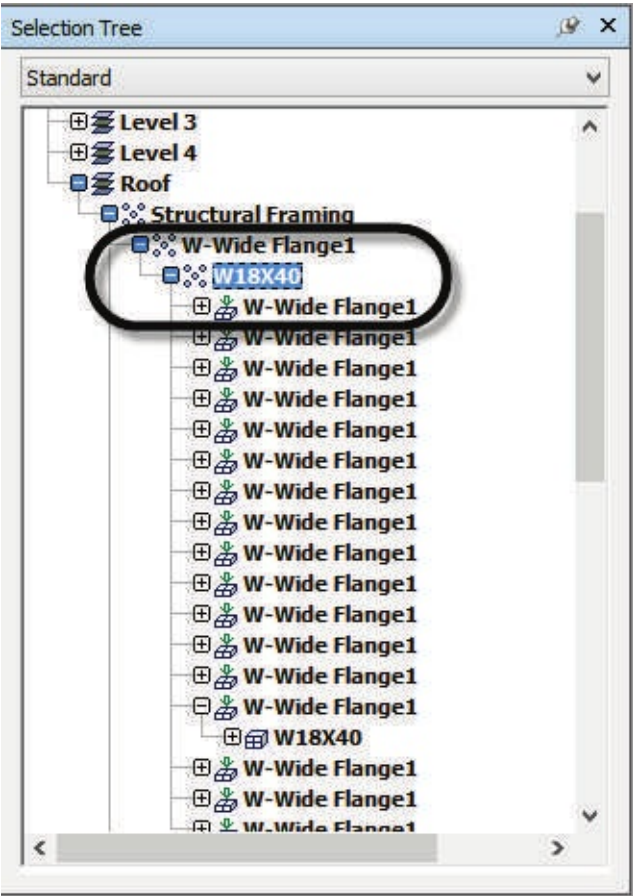
The Selection Tree can be extremely helpful when creating a takeoff by allowing you to select either a single Item or multiple Items. Let's start with the structural steel skeleton of the building.

1. In the Selection Tree, right-click *10 Architectural.nwc*, and choose: Hide.
2. In the upper left-hand corner of the project model, select the steel beam at the roof level.

As expected, the Item is highlighted in the Selection Tree as well ([see Figure 10.10](#)).

FIGURE 10.10

Selecting a single Item for a takeoff • Project Model Analysis •



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3. In the Quantification Workbook, in the Navigation pane, right-click Metals and choose: Take off Selected Model Items.

You should receive an error message that the selected Item could not be taken off. Here you have the option to review the information contained in the Navisworks Help regarding the possibilities on why the selected Item could not be taken off. In summary, this Item could not be taken off because it is at a Group level. Since this Item is a Group but part of an Instance Group, which is higher than the Group level, the Instance Group must be selected in order to perform the takeoff.

Note: Quantification only supports model takeoff for Items that are at the Group level or higher.

4. In the alert dialog, click the No button.

5. In the Selection Tree, click W-Wide Flange1 (immediately above the highlighted Item), right-click, select the Quantification fly out, and then choose: Take off to: Metals.

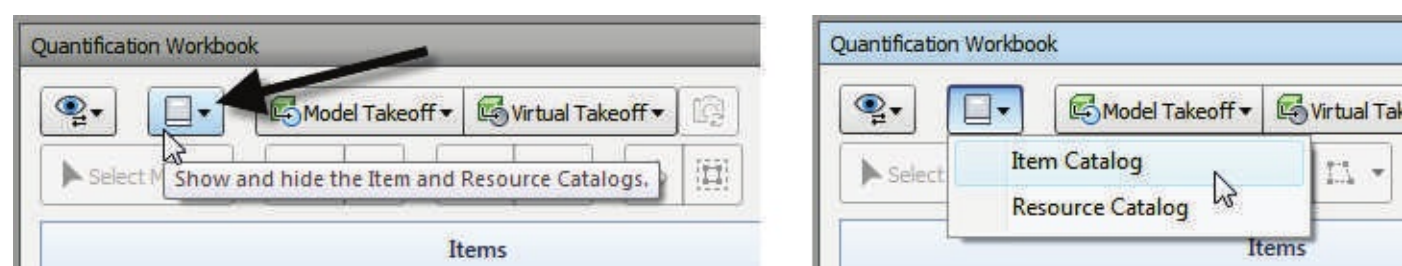
The wide flange beam has now been added to the takeoff. Use the scrol bar in the Takeoff pane to view the properties of this particular takeoff. Since we have created a W18X40

takeoff let's continue to add to this particular Group.

6. In the Selection Tree, click the Collection W18X40 that is associated with the W-Wide Flange 1 Item that was just added to the takeoff (see [Figure 10.11](#)).

FIGURE 10.11

Selecting multiple Items for a takeoff • Section III •



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7. Drag the Collection Items to the Takeoff pane and drop it.

Here we are using drag and drop functionality to add Items to the takeoff. Since one of the Items included in the Collection has already been added to the takeoff, a prompt is given if you want to include this Item in the takeoff again. Since we do not want to include duplicate Items in our takeoff we will choose not to include it again.

8. In the alert dialog, click No.

In the Navigation pane, you should note that there are (41) W18X40 items included in the takeoff. (Scroll to the right to see this in the Count column). Let's hide the Items that we have included in the takeoff.

9. In the Quantification Workbook, on the Quantification Toolbar at the top, click the Hide Takeoff button.

USING SELECTION SETS TO PERFORM A TAKEOFF

Let's review another way we can add to the takeoff. Let's select multiple Items but not using the Selection Tree. Let's use a Selection Set to select Items that we want to add to our takeoff.

1. In the Quantification Workbook, on the Quantification Toolbar, click the Show and hide catalogs drop-down and choose: Item Catalog ([see Figure 10.12](#)).

FIGURE 10.12

Open the Item Catalog

If necessary, dock the Item Catalog window to the left side of the screen and pin it open.

2. In the Quantification Workbook, in the Navigation pane, click Metals.

Notice that the same Items are highlighted in both the Quantification Workbook and in the Item Catalog.

3. In the Item Catalog window, click the New Item button.

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4. In the Item Name value box, type: **12K5** press ENTER and then close the Item Catalog window.

If necessary, on the Home tab, on the Select & Search panel, click the Sets drop-down and choose: Manage Sets. Pin the Sets window open.

5. In the Sets window, click Steel – 12K5.

6. In the Quantification Workbook, in the Navigation pane, right-click the highlighted Item and then choose: Take off Selected Model Items.

USING SEARCH SETS TO PERFORM A TAKEOFF

The steel bar joists that were contained in the Selection Set were added to the takeoff. In addition, since Hide Takeoff was selected those Items are no longer displayed in the Scene View. Let's look at performing an additional takeoff for the mechanical system in the project model. In addition, let's review how we can use Search Sets to perform the takeoff.

1. Press ESC to clear the selection.

2. In the Selection Tree, right-click *10 Structural.nwc*, and choose: Hide.

3. In the Sets window, select the Round Duct item.

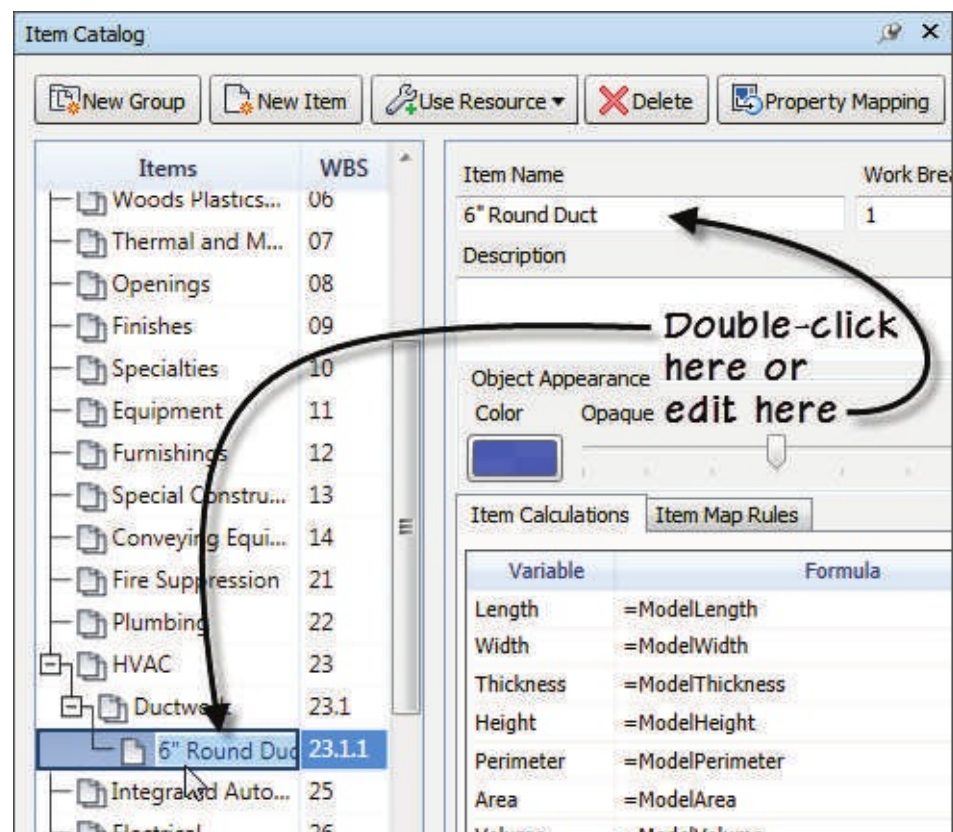
4. In the Quantification Workbook, in the Navigation pane, scroll down, right-click HVAC, and then choose: Take off Selected Model Items.

5. In the Quantification Workbook, in the Navigation pane, click Round Duct.

You should note that in the Roll up pane that there is approximately 279' of ductwork (shown in the Length column). Remember for the discussion above, the Rollup pane displays the summary of the takeoffs while the Takeoff pane displays all the takeoffs. The problem that occurs with creating a takeoff for Round Duct is there could be any size ductwork included in the takeoff as the Search Set criteria was strictly based on searching for an Item Name containing Round Duct. Having all the ductwork combined under one takeoff does not help delineate specific sizes and associated lengths of that specific size ductwork. Without that detailed information, it might become difficult to determine what is needed for the project. Let's look at how we can further delineate our takeoff for the mechanical system.

We'll start by deleting our Round Duct takeoff.

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6. In the Quantification Workbook, on the Quantification Toolbar, click the Show and hide catalogs drop-down button and then choose: Item Catalog.

7. In the Item Catalog, click the Delete button and then in the alert dialog, click Yes.

8. In the Item Catalog, select HVAC, at the top click the New Group button, type: **Ductwork** and then press ENTER.

9. In the Sets window, select 6" Round Duct.

10. In the Quantification Workbook, right-click Ductwork, and then choose: Take off to Selected Model Items.

Notice that there has been 14 Items added to the Quantification Workbook. Let's change the name of the Item to better reflect the takeoff we just completed.

11. In the Item Catalog window, in the Item list, double-click on the name: Taps to rename it.

12. Input: **6" Round Duct** and then press ENTER to apply the new name (see [Figure 10.13](#)).

FIGURE 10.13

Rename an item in the catalog 13. In the Sets window, click 8" Round Duct.

14. In the Quantification Workbook, right-click Ductwork, and then choose: Take off to Selected Model

Items.

15. In the Item Catalog window, rename Taps to: **8" Round Duct**.

16. Repeat the process for the 10" Round Duct.

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You should note that in the Rol up pane that there is approximately 42' of 10" round ductwork. This takeoff makes it easier to determine the specific material requirements for the project in lieu of a single takeoff for all of round duct in the project. Let's take a step back and look at what we have done this far.

17. Close the Item Catalog, the Selection Tree, and the Sets window.

18. In the Quantification Workbook, click Hide Takeoff.

19. Zoom in the Scene View to observe the Color of the ductwork for the Items that have been taken off.

At this point, we have learned how to quickly create a takeoff. From here you can continue to explore the Quantification tools or if you would like you can export your Quantification Workbook to an XML or Excel file.

From here, you can apply the concepts that you just learned to your projects to create detailed takeoffs. As you become more familiar with the Quantification Workbook and the tools you might want to begin creating your own catalogs. Here is a link an Autodesk Navisworks Quantification Template located on the Autodesk website: [http:// knowledge.autodesk.com/support/navisworks-](http://knowledge.autodesk.com/support/navisworks-)

[products/downloads/caas/downloads/content/autodesk-navisworks-quantification-catalog-creation-template-2014.html](http://knowledge.autodesk.com/support/navisworks-products/downloads/caas/downloads/content/autodesk-navisworks-quantification-catalog-creation-template-2014.html)

This URL was valid at the time of publication, however, given the nature of websites and addresses, should the link prove invalid, try searching for: Autodesk Navisworks Quantification Catalog Creation Template in your favorite search engine. Please feel free to continue experimenting in this file or try creating a new takeoff in a project of your own.

PREPARE TO CLOSE YOUR PROJECT FILE

If you would like to save the file you were working on herein to return to it later, you can save the project file as another name through the Application Menu with Save As. Otherwise let's close the project file without saving.

20. From the Application Menu, choose: Exit Navisworks.

21. When prompted to save the changes to the project file, click No.

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SUMMARY

The Quantification Workbook and the associated tools are used to create takeoffs of your project model. You can takeoff a single or multiple Items. You can use Search Sets to perform a takeoff as well as delineating the information to better suit project needs.

Takeoffs can be used to help determine the specific material requirements for your project.

Individual takeoffs can be controlled by color or even hidden in the Scene View once the takeoff has been performed.

Takeoffs can be exported to an XML or Excel file format in order to be shared with the project team.

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Section IV

Visualization

WHAT’S IN THIS SECTION?

Navisworks allows you to visualize your project model once all the model components have been assembled together. In addition, the model navigation experience can be greatly enhanced by providing interactivity actions to items within the project model. This kind of interaction can be also used to help determine potential clashes in the project model. Please note that the tools discussed in this Section apply only to the Navisworks Manage and Navisworks Simulate products.

SECTION IV IS ORGANIZED AS FOLLOWS: •

Chapter 11 Navisworks Animator

•

Chapter 12 Navisworks Scripter



Chapter 11

Animator

INTRODUCTION

In this chapter, we'll review the Animator tool in Navisworks. The Animator tool should not be confused with an Animation in Navisworks. The two are completely different but somewhat related. The Animator tool allows you to create multiple animations of the same or different objects in the same scene. For example, sliding doors opening as you walk through them or a crane moving into position on the project site or even the crane arm moving. You can also link Animator to TimeLiner to show animations as a Task starts.

Animator can even be linked to Clash Detective as well. An Animation is the total of these events or just simply a walkthrough of your building project. So while related, the overall goal of this chapter is to help you understand the Animator tool.

OBJECTIVES

To acquaint you with the Animator tool that allows you to create Animations and then apply movement of selected items in the project model. Topics we will explore include:

- Create Animations using Viewpoints and Selection Sets.

- Use Gizmos to create Animations.
- Modify critical Keyframes to “fine tune” the Animation.

USING ANIMATOR

Navisworks provides the ability to animate objects in the project model through the Animator tool. The movement of objects can then be recorded in an Animation and shared with the project team. The Animator tool can help supplement both the Clash Detective and TimeLiner tool as well or even provide additional interest to a simply walkthrough.

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OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for instructions.

1. Launch your Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

3. In the Open dialog, browse to the location where you installed the dataset files.

4. In the *Chapter11* folder, select the *11 Entry Vestibule.nwf* file and then click Open.

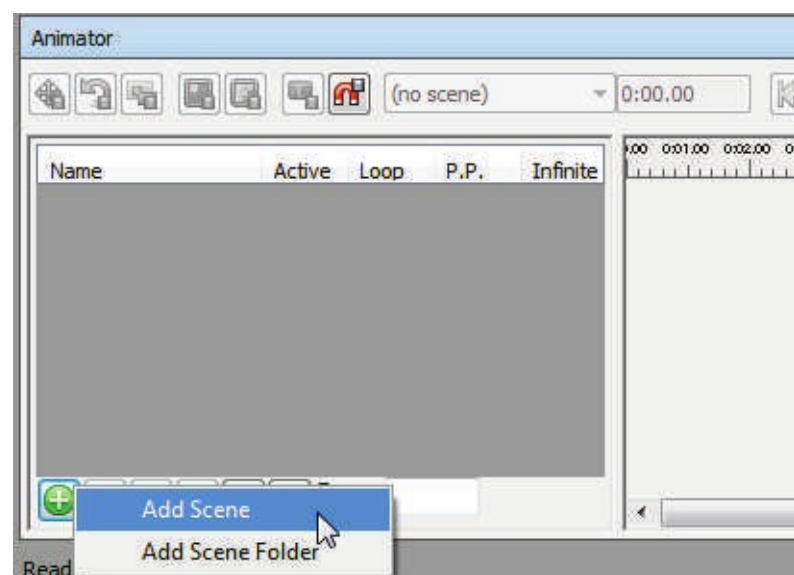
Note: Use the Files of type: drop-down in the Open dialog to either display all the Navisworks files in a folder or isolate particular types of Navisworks files, in this case NWF files.

5. Above the ViewCube, click the home icon.

This is a very simple model with several doors. In this example, we are going to walk through them like we are entering a building. However, as we walk through the doors they will automatically open for us. To simplify the exercise, we only included the vestibule here.

However, once you understand the concept for animating objects and creating an animation, you can apply that knowledge to any objects in your own project models.

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TIP: Before you can animate objects in Navisworks, you must make sure that the components that make up the item(s) that you wish to animate are broken down into individual parts.

For example, a double door might be placed as a single continuous item in the BIM

authoring tool used to create the model. This means that when that item is selected in Navisworks both doors and its frame will be selected and act as one object. If you desire to animate each individual door opening in Navisworks, you will need to break down that particular component to the individual parts (two individual door panels and separate frame) in the BIM authoring tool. However, if your desire is to show the removal of a chiller from a mechanical room you would not need to break the chiller down to multiple components.

CREATE AN ANIMATION

Let's begin our review the Animator tool.

1. On the Home tab, on the Tools panel, click the Animator button, pin the window open, and dock it to the bottom of the screen if necessary.

While perhaps not obvious at first, the Animator tool is fairly straight forward to use. Let's create our first animation. We will start by first creating a Scene.

2. In the Animator window, click the Add Scene button (large green plus sign) and then choose: Add Scene from the contextual menu (see [Figure 11.1](#)).

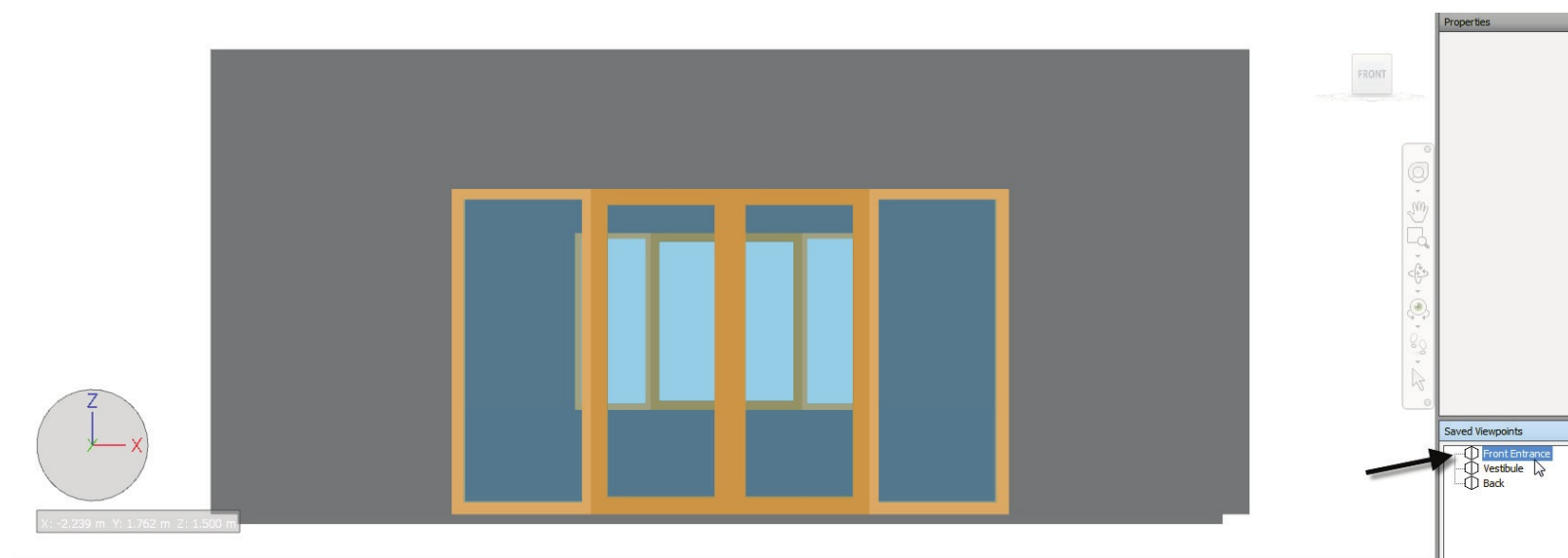
FIGURE 11.1

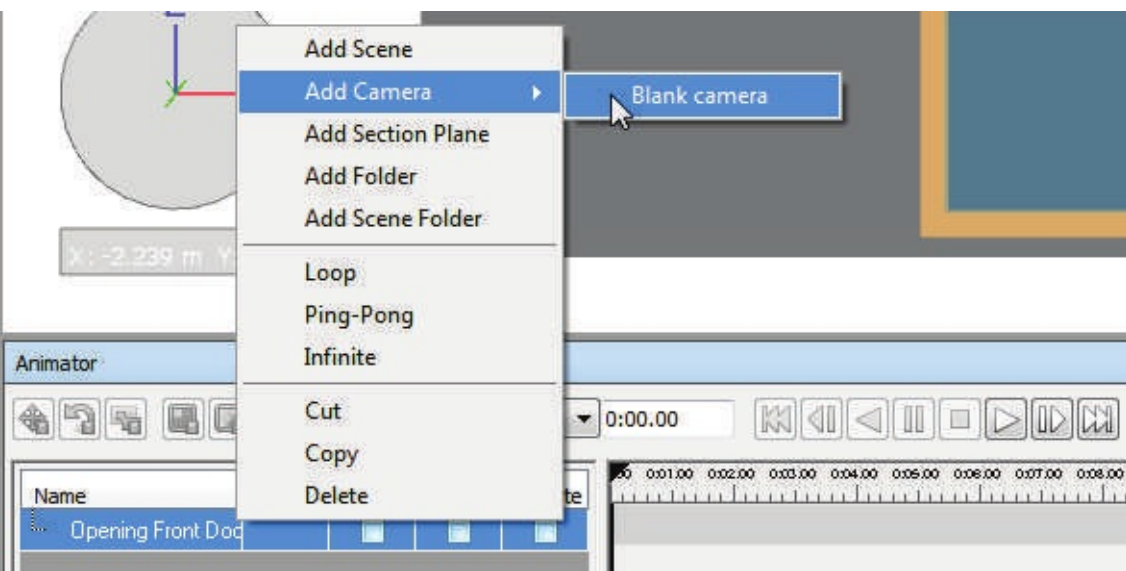
Add a new scene

3. Click directly on the name: Scene 1 to rename it. Type: **Opening Front Doors** and then press ENTER.

Now that the Scene has been created we need to add a Camera to the Scene.

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4. On the View tab, on the Workspace panel, click the Windows drop-down and then place a checkmark in the box next to Saved Viewpoints.
5. In the Saved Viewpoints window, select: Front Entrance (see [Figure 11.2](#)).

FIGURE 11.2

Orient the view to a saved viewpoint 6. In the Animator window, in the scene pane, right-click on the Opening Front Doors Scene.

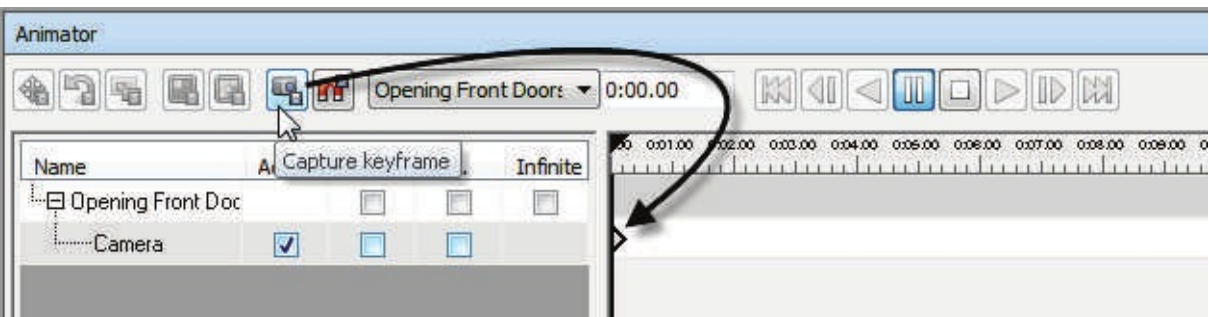
7. From the Add Camera fly out, choose: Blank Camera (see [Figure 11.3](#)).

FIGURE 11.3

Orient the view to a saved viewpoint A small plus sign (+) will appear next to Opening Front Doors.

8. Expand the plus sign next to Opening Front Doors and then select Camera indented beneath it.
9. On the toolbar at the top of the Animator window, click the Capture keyframe icon (see [Figure 11.4](#)).

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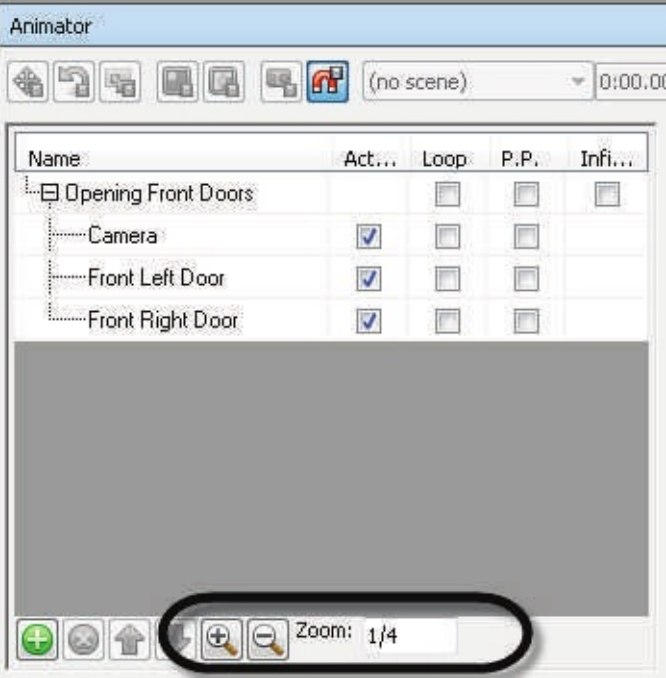


FIGURE 11.4

Add a keyframe for the camera One of the things that needs to be done for this animation is to define a walk path through the Vestibule. In capturing this keyframe, we have set the starting point of our Animation path. Let's finish creating the Animation path. In [Chapter 5](#) we learned that we can define a start point and an end point for animations and then let Navisworks interpolate between the two points to create the animation path. So we now have the Front Entrance Viewpoint serving as our start point. We will need to create a midpoint and an end point for the path next. The midpoint will be the Saved Viewpoint called: Vestibule and the endpoint will be the Saved Viewpoint called: Back. Each will require a Keyframe. Let's create those Keyframes now. Let's also adjust the Timescale so we can read it better.

10. Below the Scene pane, click the Zoom in icon twice (until the value of the Zoom factor is 1/4) ([see Figure 11.5](#)).

FIGURE 11.5

The Timeline Zoom factor can be modified to increase or decrease the Timescale value 11. In the Timeline View pane, on the Timescale, click the Time Slider (black inverted triangle) and manually move it to 0:04.00 ([see Figure 11.6](#)).

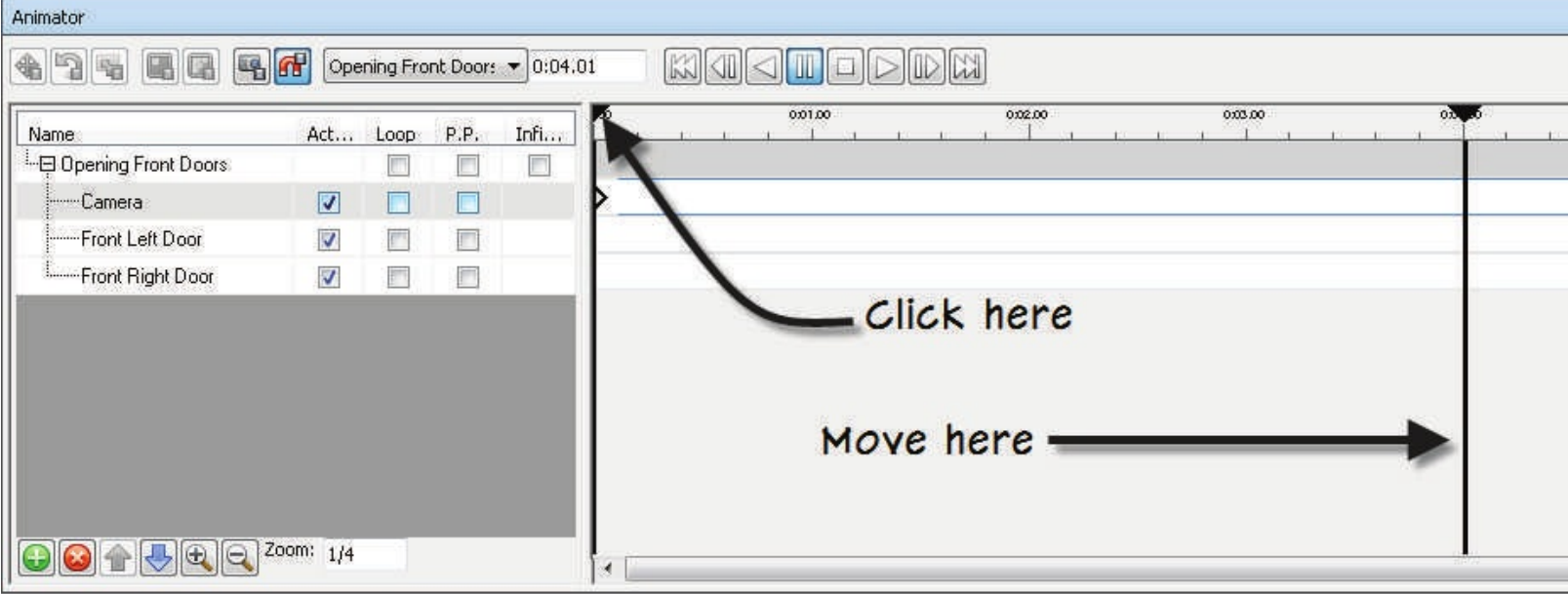


FIGURE 11.6

Manually moving the Time Slider on the Timescale 12. In the Saved Viewpoints window, select Vestibule.

13. In the Animator window, click the Capture keyframe icon.

Notice the appearance of the green Animation Bar in the Timeline View Pane. Now let’s create our endpoint for the Animation.

14. In the Timeline View pane, on the Timescale, click the Time Slider (black inverted triangle) and manually move it to 0:08.00.

HINT: The Time Slider (black) will lie beneath the End Slider (red). Remember the End Slider is fixed unless it is manually moved. Clicking the End Slider (red inverted triangle) on the Timescale will actually allow you to grab and move the Time Slider (black inverted triangle).

15. In the Saved Viewpoints window, select: Back.

16. In the Animator window, click the Capture keyframe icon.

17. Click the Stop icon on the Playback Controls.

Clicking Stop on the Playback Controls always returns you to the beginning of the Animation. Notice that we did not have to Record our Walk through the Animation. We quickly created our Animation path for our Animation based on a few Saved Viewpoints.

PLAY AN ANIMATION

Let's review our efforts to this point. If done correctly, you should walk right through the Entry Vestibule to the other side. This includes walking directly through the Vestibule doors as well.

1. Click Play on the Playback Controls and allow the Animation to play until it ends.
2. Once the Animation has ended, click Stop on the Playback Controls.

ANIMATING OBJECTS

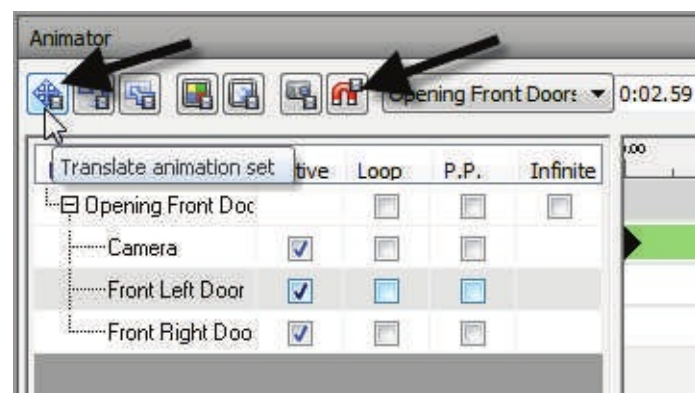
As you noted from the Animation we walked right through the doors of the Vestibule. That is not a real life situation. The doors should actually open as we walk through them. Now let's add some movement to the Vestibule Doors and have them open as we walk through them.

You should be at the front of the Entry Vestibule again.

Make sure that the Navigation Bar is active in the Scene View. If it is not, on the View tab, on the Navigation Aids panel, click the Navigation Bar button.

1. On the Navigation Bar, click the Select icon.
2. In the Scene View, using the CTRL key, select the left door frame and the associated glass in the door.
3. In the Animator window, in the Scene pane, right-click Opening Front Doors and choose: Add Animation > From current selection.
4. Rename Animation Set 1 to: **Front Left Door** and then press ENTER.
5. Press ESC to clear the selection.
6. On the Home tab, on the Select & Search panel, click the Sets drop-down and then select: Front Right Door.
7. In the Animator window, right-click Opening Front Doors, and choose: Add Animation Set > From current search/selection set.
8. Rename Animation Set 2 to: **Front Right Door** and then press ENTER.
9. Press ESC to clear the selection.

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10. In the Scene pane, click Front Left Door.

11. In the Timeline View pane, on the Timescale, click the Time Slider (black inverted triangle) and manually move it to 0:01.30 (halfway between 0:01.00 and 0:02.00).

You should notice that as you manually move the Time Slider the Scene View automatically adjusts to the appropriate location in the Animation.

12. In the Animator window, click the Capture keyframe icon.

13. Move the Time Slider to 0:02.30 (halfway between 0:02.00 and 0:03.00).

14. In the Animator window, click the Translate animation set icon (see [Figure 11.7](#)).

FIGURE 11.7

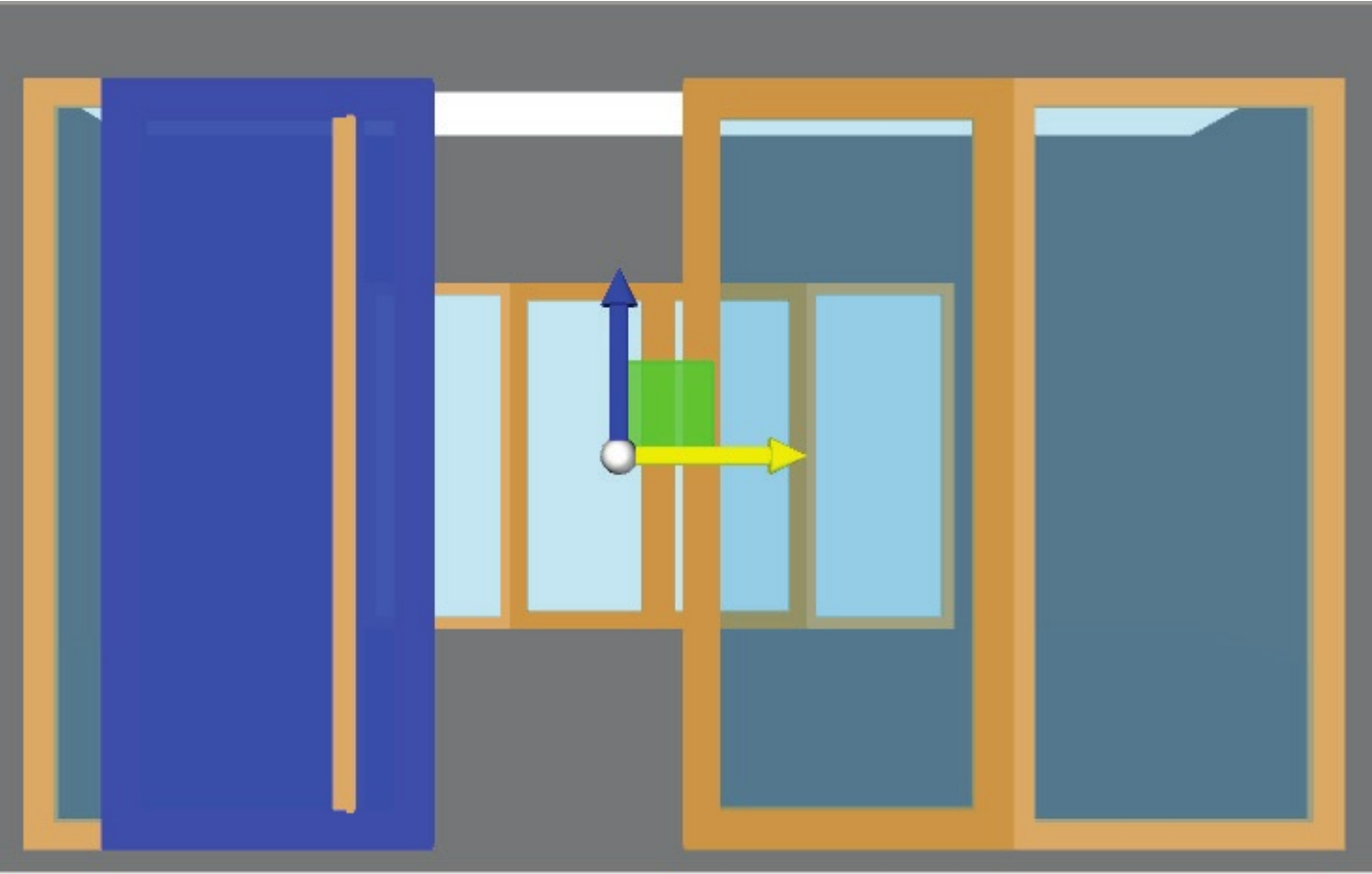
Translate (move) the current animation set Click the Toggle Snapping icon if it is not already active.

15. On the Navigation Bar, click the Select tool.

16. Scroll the middle mouse button to zoom out to the point where the entire door (top to bottom) is visible in the Scene View.

17. On the Move Gizmo, hover the mouse pointer over the horizontal axis (red) until the mouse pointer changes to a hand and the horizontal axis changes from red to yellow and then click and move the door to the left in the Scene View placing it where a sliding door might stop after it is fully open (see [Figure 11.8](#)).

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FIGURE 11.8

Moving the Animation Set with the Gizmo 18. In the Animator window, click the Capture keyframe icon.

- 19. Click Stop on the Playback Controls.
- 20. Press Esc to clear the selection.
- 21. In the Animator window, click the Translate animation set icon to toggle off the Move Gizmo from the Scene View.
- 22. Click Play on the Playback Controls and allow the Animation to play until it ends.
- 23. Once the Animation has ended, click Stop on the Playback Controls.

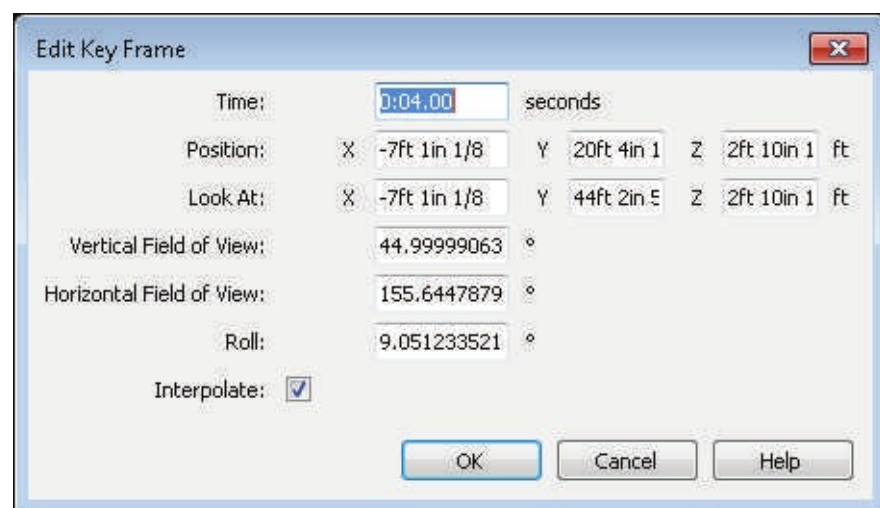
You should be at the front entrance of the Entry Vestibule again. If everything was done correctly, the left front door in the Animation should have slide out of the way as the Camera moved through the doorway. Now let’s address the right front door by repeating the steps that we did to animate the left front door.

- 24. In the Animator window, in the Scene pane, select Front Right Door.
- 25. In the Timeline View pane, move the Time Slider to 0:01.30 (in alignment with the first Keyframe of the Left Front Door).

26. In the Animator window, click the Capture keyframe icon.

27. Move the Time Slider in alignment with the second Keyframe of the Left Front Door.

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28. In the Animator window, click the Translate animation set icon.

29. Using the Move Gizmo, move the door to the right in the Scene View placing it where a sliding door might stop after it is fully open.

30. In the Animator window, click the Capture keyframe icon and then click Stop on the Playback Controls.

31. Press Esc to clear the selection and then click the Translate animation set icon to toggle off the Move Gizmo in the Scene View.

32. Click Play on the Playback Controls and allow the Animation to play until it ends.

33. Once the Animation has ended, click Stop on the Playback Controls.

You should be at the front entrance of the Entry Vestibule again. If everything was done correctly, both the doors in the Animation should have slide out of the way as the Camera moved through the doorway. Now let's fine tune the components of this Animation. Let's make sure our timing is in sync.

34. In the Timeline View pane, hover the mouse pointer over the Camera Keyframe (black diamond) located at the approximate 0:04.00 mark, right-click and choose: Edit.

35. In the "Edit Key Frame" dialog, modify Time: to read **0:04.00** if it does not already do so and then click OK ([see Figure 11.9](#)).

FIGURE 11.9

Use Edit Key frame to fine tune Timelines 36. Right-click the keyframe at the approximate 0:08.00 mark and choose: Edit.

37. In the “Edit Key Frame” dialog, modify Time: to read **0:08.00** if it does not already do so and then click OK.

38. Repeat for each keyframe to make sure that they occur at regular and logical increments: **0:01.50** and **0:02.50**.

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39. Press ESC to clear the selection.

40. In the Animator window, in the Scene pane, select the Opening Front Doors Scene.

41. Click Play on the Playback Controls and allow the Animation to play until it ends.

42. Once the Animation has ended, click Stop on the Playback Controls.

You should be at the front entrance of the Entry Vestibule again. We are off to a good start with the Animation but there is still another set of doors to contend with. We need to animate those doors to open as the Camera passes through on the Animation path. However, we are going to do something a little different with these doors. They will swing open into the Entry Vestibule as opposed to sliding open. Let's work on the other doors now.

43. In the Saved Viewpoints window, select Vestibule.

44. On the Navigation Bar, click the Select tool.

45. In the Scene View, select the left door.

46. In the Animator window, right-click Opening Front Doors and choose: Add Animation Set > From current selection.

47. Rename Animation Set 3 to: **Back Left Door** and then press ENTER.

48. Press ESC to clear the selection.

49. Repeat for the door on the right. Name it: **Back Right Door**.

50. Press ESC to clear the selection.

51. In the Animator window, in the Scene pane, click Back Left Door, move the Time Slider to: 0:05.00 and then click the Capture keyframe icon.

52. Move the Time Slider to: 0:06.30 (halfway between 0:05.00 and 0:06.00).

53. In the Animator window, click the Rotate animation set icon.

54. On the Navigation Bar, click the Select tool and then use the middle mouse button to zoom out to the point where the entire door (top to bottom) and the Rotate Gizmo is visible in the Scene View.

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Before you can rotate an item(s) in the currently selected Animation Set, the center point of the Rotate Gizmo (axis ball) needs to be moved to the location where you want the elements to be rotated.

55. On the Rotate Gizmo, hover the mouse pointer over the intersection of the horizontal axis (red) and the vertical axis (blue) until the mouse pointer changes to a hand and the intersection point, axis ball, changes from grey to yellow, while pressing and holding CTRL

click and move the Rotate Gizmo to align the vertical axis (blue) of the Rotate Gizmo with the left edge of the door.

HINT: This might take several tries and the use of the Zoom tools on more than one occasion.

Note: Pressing and holding CTRL while moving the Gizmo from the axis ball will allow the Gizmo to snap to other objects in the Scene View.

56. Once the vertical axis (blue) of the Rotate Gizmo is aligned with the left edge of the door, on the Navigation Bar, click Orbit and use the Orbit tool to rotate the Scene View to where all three axes and curved areas of the Rotate Gizmo can be seen.

If the Rotate Gizmo is not aligned with the left edge of the door or the Rotate Gizmo did not snap to the door try moving it again until everything is aligned.

57. On the Rotate Gizmo, hover the mouse pointer over the blue curved area (rotation about the vertical axis) until the mouse pointer changes to a hand, click and drag to rotate the left door into the vestibule until it is approximately 90 degrees perpendicular to the vestibule wall.

HINT: Below the Scene pane are the Rotate values as you are rotating the object. Make sure the Z and oZ values are -90.00 in this case to ensure that the door is perpendicular to the wall (see [Figure 11.10](#)).

FIGURE 11.10

Use the Rotate values to see the angle that the item(s) have been rotated by the Rotate Gizmo • Section IV •

58. In the Animator window, click the Capture keyframe icon.

59. Click Stop on the Playback Controls.

60. Press Esc to clear the selection.

You should be at the midpoint of the front entrance of the Entry Vestibule again. If everything was done correctly, the back left door in the Animation should swung out of the way as the Camera moved through the doorway. If it did not, or you are dissatisfied with the swing, you can delete the Keyframes associated with the Back Left Door Animation Set and try again.

61. In the animator window, in the Scene pane, select Back Right Door.

62. Repeat the process covered above to animate the rotation of the right door.

63. Play the animation and once it has ended, click Stop on the Playback Controls.

If everything was done correctly, both the doors in the Animation should have swung open as the Camera moved through the doorway. Now let's fine tune the components of this Animation. Let's make sure our timing is in sync.

64. In the Timeline View pane, right-click each Keyframe and choose: Edit. Adjust the times to occur at a whole **00** or half **.50** second mark.

65. Press ESC to clear the selection.

66. Play the animation again. Click Stop when finished.

Congratulations. You just created and edited an Animation in Navisworks. If you would like, you can now experiment with the Loop and Ping-Pong effects in the Animator to understand their effects on the Animation.

From here, you can apply the concepts that you just learned to your projects perhaps showing the staging of equipment on the construction site, a crane swing, or mechanical equipment coming in and out of mechanical rooms. There are endless possibilities. Please don't forget one critical component when it comes to animating items in Navisworks. Make sure that the components of the item(s) that you want/need to animate is broken down to the individual parts that need to be animated.

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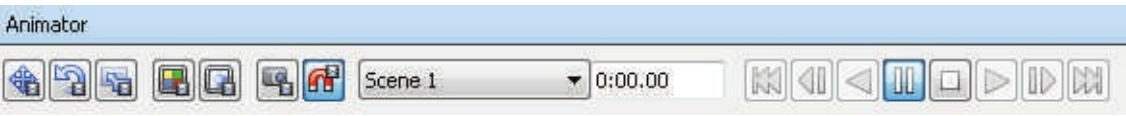
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PREPARE TO CLOSE YOUR PROJECT FILE

If you would like to save the file you were working on herein to return to it later, you can save the project file as another name through the Application Menu with Save As. Otherwise let's close the project file without saving.

- 67. From the Application Menu, choose: Exit Navisworks.
- 68. When prompted to save the changes to the project file, click no.

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QUICK REFERENCE FOR THE ANIMATOR DIALOG

The Animator panel contains a few panes and toolbars. We explored a few in the tutorial above. Here is a complete list for your ongoing reference.

Animator dialog toolbar:

FIGURE 11.11

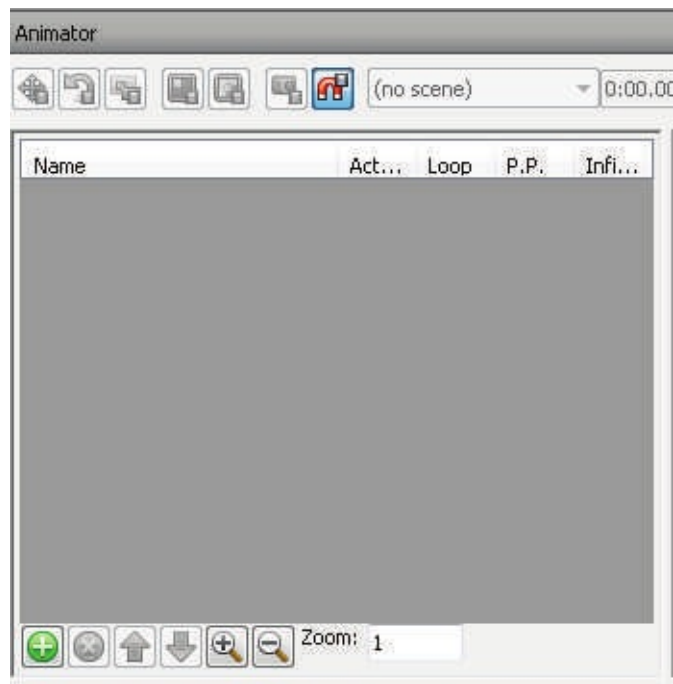
- Options available in the Animator window*
 - Translate animation set—This option displays the Translation Gizmo in the Scene View. The Translation Gizmo can be used to modify the position of the selected item(s).
 - Rotate animation set—This option displays the Rotation Gizmo in the Scene View. The Rotation Gizmo can be used to modify the rotation of the selected item(s).
 - Scale animation set—This option displays the Scale Gizmo in the Scene View. The Scale Gizmo can be used to modify the scale of the selected item(s).
 - Change color of animation set—This option displays the Color bar directly below the Scene pane. The Color drop-down will be available for Color selection of the RGB hue of the Color can be manually input. To apply the selected Color to the item(s) click the checkbox next to Color.
 - Change transparency of animation set—This option displays the Transparency slider directly below the Scene pane. The Transparency of the item(s) can also be manually input. To apply the Transparency to the item(s) click the checkbox next to Transparency.
 - Capture keyframe—This option takes a “snapshot” of the current Scene View and displays the keyframe in the Animator Timeline pane.
 - Toggle snapping—This option enables/disables snapping. Snapping is used when moving an item(s) with the Gizmo in the Scene View.

Scene picker—This drop-down allows you to select the Scene to make active in the Scene pane.

Time position—This option displays the current position of the Time slider in the Timeline View.

Playback Controls—The Playback Controls allow you to Rewind, Step Back, Play Backwards, Stop, Pause, Play, Step Forward, or Forward the simulation.

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Animator Scene pane:

The left pane below the Animator options is the Scene pane ([see Figure 11.12](#)).

FIGURE 11.12

The Scene pane in the Animator window This pane helps manage your Scenes. Scene trees display the components of the Scene (i.e. Cameras, Animation Sets, etc.). There is only one option directly below the Scene pane that is available when a Scene(s) have not been created yet. That option is: Add Scene—This option adds a new Scene in the Scene pane.

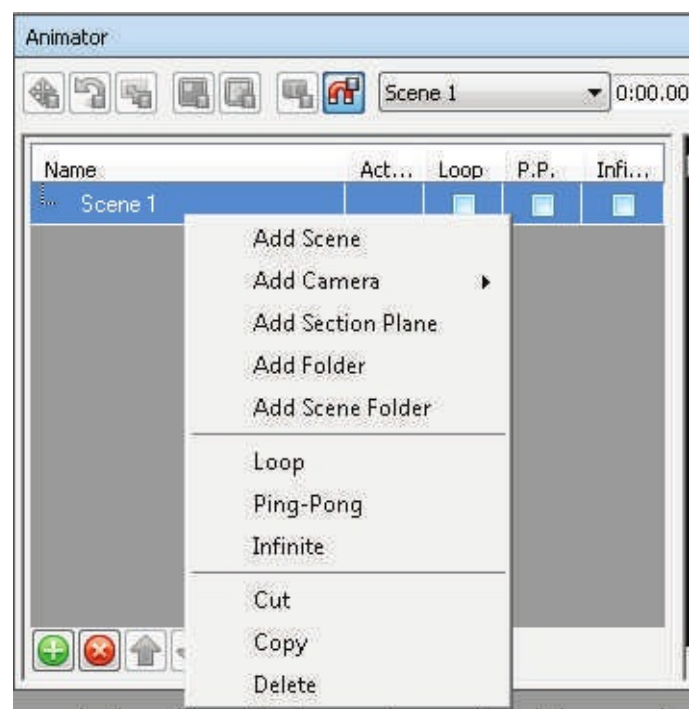
A contextual menu is available through the Scene pane when right-clicking in the Task pane. There are only two options available in the contextual menu. The first option available in the contextual menu, and previously discussed, is Add Scene. The other option is:

Add Scene Folder—This option adds a Scene Folder to the Scene Pane.

Scene Folders can contain Scenes or other Scene Folders. Scene Folders cannot contain components of the Scene (i.e. Cameras, Section Planes, Animation Sets, etc.)

Once a Scene has been created, you can right-click on any component of the Scene to receive a contextual menu (see [Figure 11.13](#)).

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FIGURE 11.13

The Scene pane contextual menu There are several options available in the contextual menu in addition to the Add Scene and Add Scene Folder options previously discussed: Add Camera—This fly out allows you to add a Camera to the Scene tree.

Blank Camera—Adds a Camera to the Scene tree.

Add Animation Set—This fly out allows you to add an Animation Set to the Scene tree.

From current selection—Click this option to add the currently selected items in the Scene View as an Animation Set in the Scene tree.

From current search/selection set—Click this option to add all items from the currently selected Selection or Search Set as an Animation Set in the Scene tree.

Update Animation Set—This fly out allows you to update the selected Animation Set in the Scene tree.

From current selection—Click this option to update the selected Animation Set in the Scene tree with the item(s) currently selected in the Scene View.

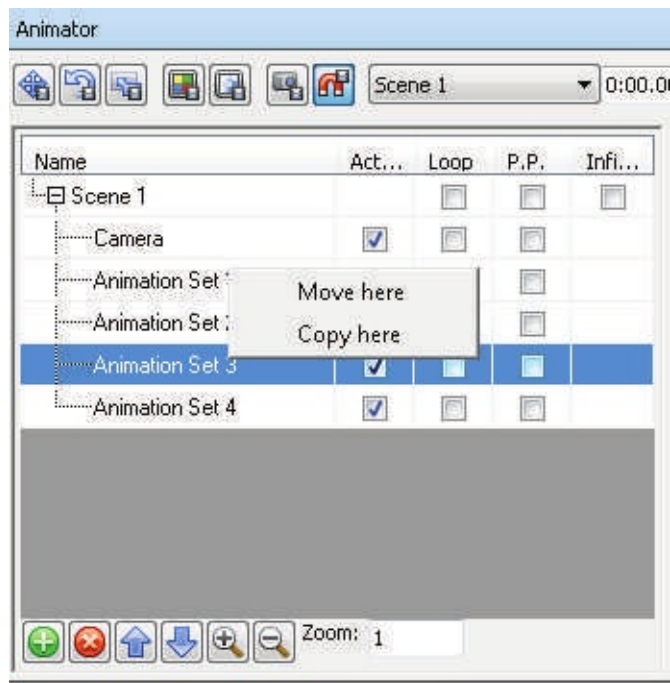
From current search/selection set—Click this option to update the selected Animation Set in the Scene tree with the Selection or Search Sets currently selected.

Add Section Plane—This option adds a Section Plane to the Scene tree.

Add Folder—This option adds a new Folder to the Scene tree. Folders hold Scene components and should not be confused with Scene Folders which only contain Scenes. For example, Use the Add Folder option to add a folder in the Scene tree to contain all your Animation Sets.

Active—This option enables/disables the selected component in the Scene tree.

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Loop—This option restarts the Animation from the beginning once the Animation ends.

Ping-Pong—This option will play the Animation backwards once the Animation ends.

Infinite—This option is only available for Scenes and when applied will continually play the Animation until Stop or Pause is selected.

Cut—This option Cuts the selected item in the Scene tree and places it on the Clipboard.

Note: Only one item can be selected in the Scene tree. The CTRL or SHIFT functionality to select multiple items is not available in the Scene tree.

Copy—This option pastes the Cut item from the Clipboard into the new location in the Scene tree.

Delete—This option Deletes the selected item from the Scene tree.

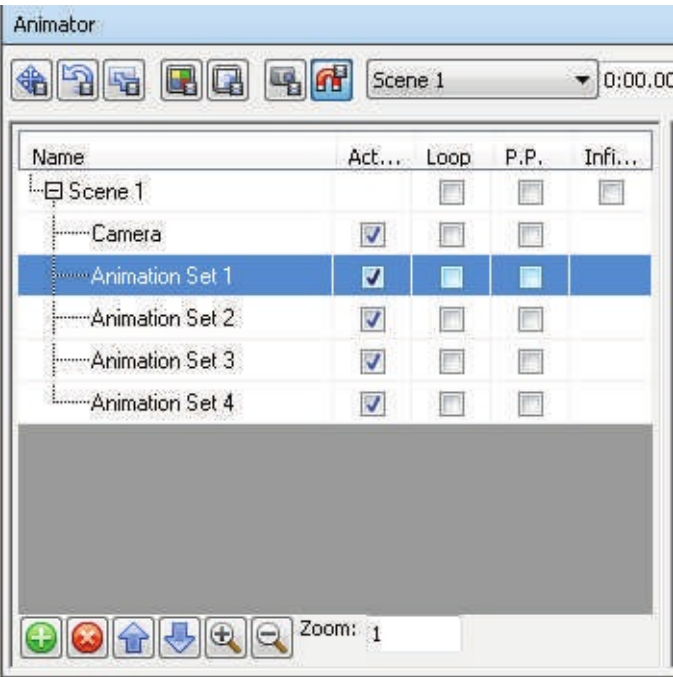
Within the Scene pane, animation components can be moved by dragging the component to a new location. To do this, select the component in the Scene tree and once selected right-click and move the component to the position that you would like to place it in the Scene tree. Once you begin to move the mouse away from the selected component the mouse pointer will change to an arrow. Once at the new location in the

Scene tree, release the right mouse button and a contextual menu will be displayed ([see Figure 11.14](#)).

FIGURE 11.14

The contextual menu when moving components of a Scene The options in the contextual menu are:

- Move here—This option moves the selected component in the Scene tree to the new location selected.
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- Copy here—This option copies the selected component in the Scene tree to the new location selected.
- Below the Scene pane are several other options ([see Figure 11.15](#)).

FIGURE 11.15

Scene pane options

Only four options are available without anything selected in the Scene pane. One of those options, Add Scene, has been previously discussed. The remaining three options that are available without anything selected in the Scene pane are:

- Zoom in—This option reduces the time shown on the Timescale by 1/2. If 37

seconds are shown on the Timescale and Zoom in is clicked then approximately 18 seconds will be shown on the Timescale.

- Zoom out—This option increases the time shown on the Timescale by a factor of 2. If 18 seconds are

shown on the Timescale and Zoom out is clicked then approximately 37 seconds will be shown on the Timescale.

Zoom: —Use this value box to manually input a zoom value for the Timescale.

This box also reflects the current Timescale zoom factor.

Note: You can Zoom in and Zoom out of the Timeline by clicking the Timeline and rolling your mouse wheel either backwards (Zoom in) or backwards (Zoom out).

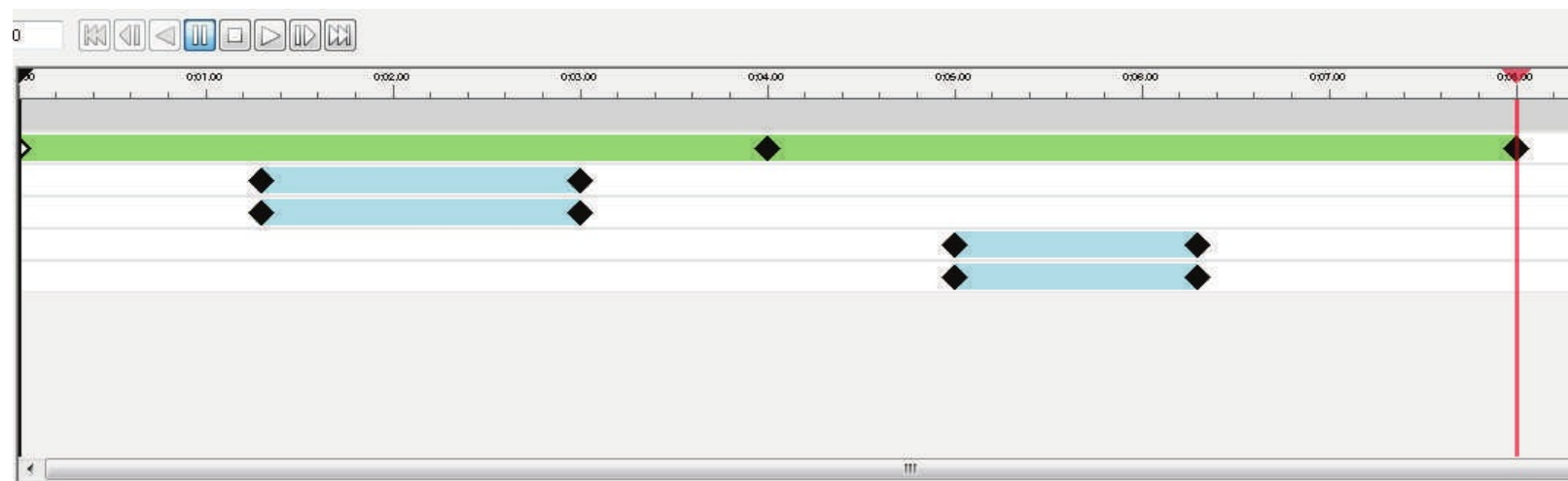
Once something is selected in the Scene pane the remaining options become available.

Those options are:

Delete—This option Deletes the selected item in the Scene pane.

Move up—This option moves the selected item up one position in the Scene tree. The Move up option is only available if the selected item can actually Move up one position in the Scene tree. If the selected item cannot Move up one position in the Scene tree this option will not be available.

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Move down—This option moves the selected item down one position in the Scene tree. The Move down option is only available if the selected item can actually Move down one position in the Scene tree. If the selected item cannot Move down one position in the Scene tree this option will not be available.

Finally, the Timeline View pane displays the Timescale and the Timelines, with Keyframes, for Animation Sets, Cameras, Section Planes, etc. ([see Figure 11.16](#)).

FIGURE 11.16

Timeline View pane in the Animator window The Timeline View pane is where Animations are edited. At the top of the Timeline View pane is the Timescale bar shown in seconds with all times starting at 0.

When an item is selected in the Scene pane, right-click the Timescale to open a contextual menu that allows you to Move or manually position the endbar. Let's review the other key components of the Timeline. Those components are:

Keyframes—Represented by black diamonds. Keyframes can be manually moved in the Timeline by dragging the black diamond to the left or right. Left click on the Keyframe to move the Time slider to that position. Right-click on the Keyframe to open a contextual menu. Here are the options available in the contextual menu:

Edit—Click this option to open the Edit Key Frame dialog in order to manually modify the Keyframe settings.

Go to keyframe—Click this option to move the Time Slider to this Keyframe. The definition of the Time Slider is discussed in the Slider section below.

Cut—This option Cuts the selected Keyframe in the Timeline View pane and places it on the Clipboard.

Copy—This option Copies the selected Keyframe in the Timeline View pane and places it on the Clipboard.

Paste—This option pastes either the Cut or Copied Keyframe from the Clipboard into the new location in the Timeline View pane.

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Delete—This option Deletes the selected Keyframe from the Timeline View pane.

Interpolate—This is the default option in Animator. Navisworks automatically interpolates between the current and last Keyframe. If this option is deselect, there will not be a smooth transition between the current and last Keyframe.

Animation Bars—Used to visualize Keyframes in the Timeline and are colored coded and cannot be edited. A different color is used for each Animation.

Sliders—Colored vertical lines shown in the Timeline.

Time Slider—The black vertical line representing the current position of the playback. The Time Slider can manually adjusted by dragging the slider either left or right. As the Time Slider moves, or is manually moved, the Scene View is updated accordingly.

End Slider—The red vertical line representing the end point of the active Scene. The End Slider is typically set to the last Keyframe in the Scene.

You can manually move the End Slider by right-clicking on it and selecting Manually positing endbar in the contextual menu. If the End Slider is moved it can be returned to its original position by right-clicking on it and selecting Reset endbar to scene end in the contextual menu.

SUMMARY

The Animator tool is used to create a Camera view from Saved Viewpoints and use selected items and Selection Sets to animate individual components of the project model. In addition, we can edit critical Keyframes of the Animation in order to “fine tune” our animation.

Saved Viewpoints can be used when creating Camera views allowing Navisworks to Interpolate between the Saved Viewpoints in order to create the Scene playback.

Selected items, or Selection or Search Sets containing items, can be used when animating individual components of the project model to show movement of those components.

Timelines and critical Keyframes of the Animation can be edited to “fine tune” the animation or the components of the Animation.

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Chapter 12

Scripter

INTRODUCTION

Now we are ready to review the Scripter tool in Navisworks. The Scripter tool allows you to add interactivity to the project model by assigning Scripts to Animations. A Script should be thought of as a collection of Events that happen in the project model when defined conditions are met. For example, an Animation can be triggered by an Event that was created with the Scripter tool. In the previous chapter we created an Animation that opened doors as the camera path moved through the doors. Since items were animated in that Animation, we can use them when to create interaction points in the project model.

With the Scripter tool, an interaction point can be created that will open those doors as we use the Walk to navigate through them. The goal of this chapter is to help you understand the Scripter tool which can help you further define interaction points within the project model, based on Animations that were created with the animator tool.

OBJECTIVES

To acquaint you with the Scripter tool that allows you to define additional interaction points within the project model based on Animations created with the Animator tool.

Topics we will explore include:

- Create Scripts to define existing Animations.
- Define Events and Actions associated with the Script.

USING SCRIPTER

Navisworks provides the ability to define interaction points within the project model by assigning Scripts to Animations that were created with the Animator tool. Events are triggered by specific interactions as established in the Scripter tool. This Event could be something as simple as reaching a specific point in the project model and a defined Animation playing. This might be navigating to a set distance from a door and the door opening for you as you navigate through it or that very same door closing as you navigate

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away from it. The Scripter tool can further enhance project model interaction when navigating through the project model. Let's review the Scripter tool to learn how we can define additional interaction points within the project model.

OPEN A PROJECT FILE

The lesson that follows requires dataset files that are available for download as a companion to this

book. If you need to install the files, please refer to the [“Book Dataset Files”](#) topic in the Preface for instructions.

1. Launch your Navisworks Manage.

TIP: Since this book is focused on the Navisworks Manage product, you can click the Windows Start button, and then begin typing **Manage** in the “Search program and files”

field. After a couple letters, your installed version of Manage should appear near the top of the list. Click it to launch to program.

2. On the QAT, click the Open icon.

TIP: The keyboard shortcut for Open is CTRL + O. Open is also located in the Application Menu (big “N”).

3. In the Open dialog, browse to the location where you installed the dataset files.

4. In the *Chapter12* folder, select the *12 Entry Vestibule.nwf* file and then click Open.

Note: Use the Files of type: drop-down in the Open dialog to either display all the Navisworks files in a folder or isolate particular types of Navisworks files, in this case NWF files.

5. Above the ViewCube, click the home icon.

You should now be looking at a simple model of an entry vestibule that we used in the previous chapter to learn about the Animator tool. Both sets of doors in this model have had object animation applied to them. We are going to define interaction points that will take place when we reach a specific point in the project model from the doors and that interaction point will automatically open those doors. In addition, the doors will close as we navigate • Section IV •

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away from them. Once you understand the concept of the Scripter tool in this simple file, you can apply that knowledge to create interaction points in your own project models.

SETTING UP AN ANIMATION WITH SCRIPTER

1. On the Animation tab, on the Script panel, click the Scripter button.

If necessary, pin the window open, and dock it to the bottom of the screen.

If you worked through the exercises from the previous chapter then that should help you get up to speed faster with the Scripter tool.

If Saved Viewpoints is not already open, on the View tab, on the Workspace panel, click the Windows drop-down and then place a checkmark in the box next to Saved Viewpoints.

2. In the Saved Viewpoints window, click Front Entrance.

3. In the Scriptor window, below the Scriptor View pane, click the Add Folder icon and then rename it to: **Entry Vestibule** and then press ENTER.
4. Right-click on the Entry Vestibule Folder, choose: Add New Script and then rename the Script to: **Open Left Front Door** and then press ENTER.
5. Repeat to create: **Open Right Front Door**.

Now that our Folder and Scripts have been created we need to add Events to the Script and define those Events.

6. In the Scriptor window, in the Scriptor View pane, select Open Left Front Door.
7. In the Scriptor window, below the Events View pane, click the On Hotspot icon.

In the Properties View area, verify that the Hotspot drop-down is set to: Sphere.

8. Click the Trigger when drop-down and then choose: In Range.
9. In the Properties View area, click the Pick button.
10. In the Scene View pick the center point at the bottom of the two doors where the two doors come together (see [Figure 12.1](#)).

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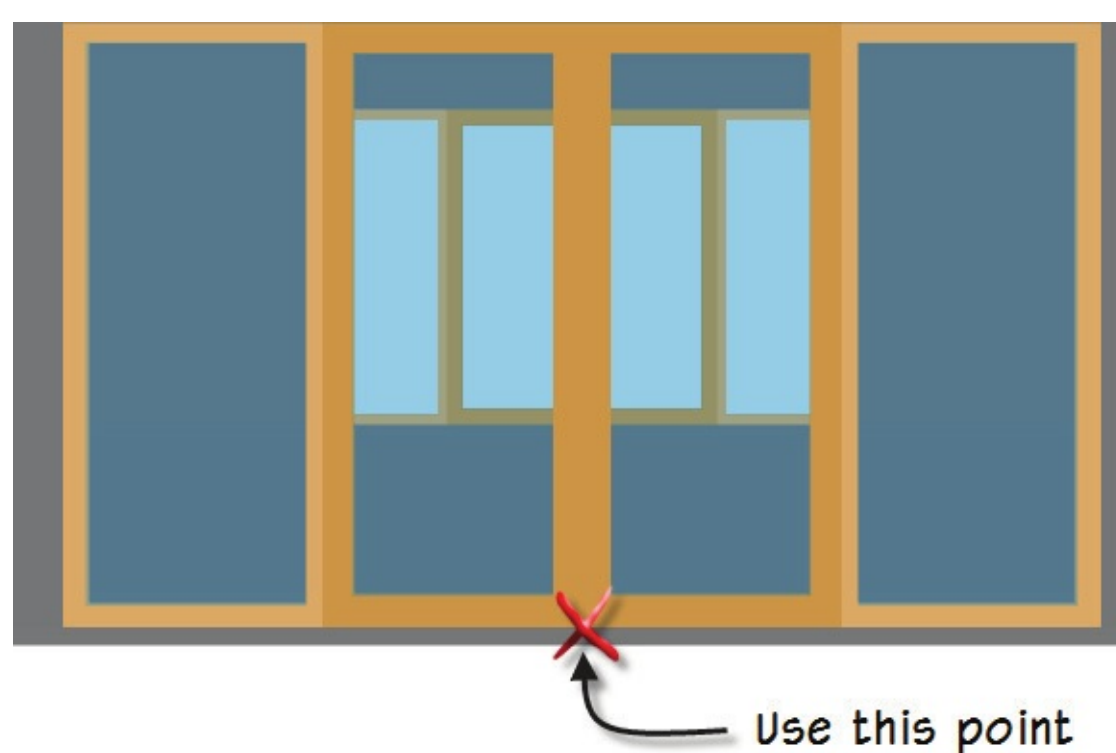


FIGURE 12.1

Selecting a trigger point for the Script In the Properties View area you should note that the X, Y, and Z Position values automatically updated based on the point selected in the Scene View.

11. In the Properties View area, in the Radius field, type: **12ft** and then click in the Scene View for the value to be accepted.

Now let's do the same for the right front door in the Entry Vestibule.

12. In the Scriptor window, in the Scriptor View pane, click Open Right Front Door.

13. In the Scriptor window, below the Events View pane, click the On Hotspot icon.

14. In the Properties View area, make sure that Hotspot is set to: Sphere, set Trigger to: In Range, and then use the Pick button to select the same location.

In the Properties View area you should note that the X, Y, and Z Position values automatically updated based on the point selected in the Scene View.

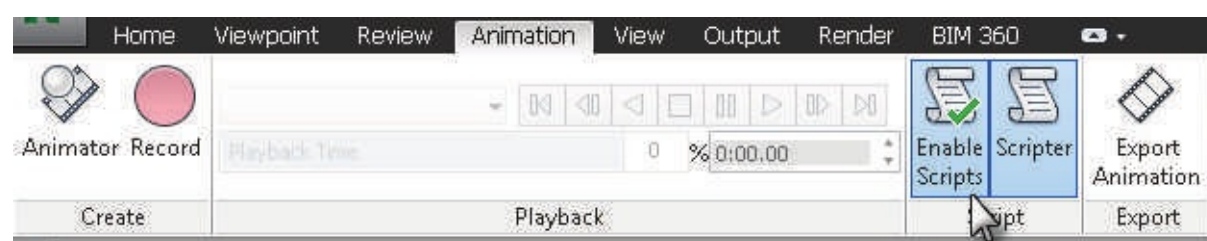
15. In the Properties View area, in the Radius field, type: **12ft** and then click in the Scene View for the value to be accepted.

With these steps, we have created an Event involving both Entry Vestibule Front Doors. This Event will trigger a Script whenever we navigate within 12 feet of those doors. Now let's define the Action of the Script.

16. In the Scriptor window, in the Script View pane, click Open Left Front Door.

17. In the Actions View pane, click the Play Animation icon.

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18. In the Properties View area, click the Animation drop-down and then expand Opening Front Doors and then select: Front Left Door.

19. In the Scriptor window, in the Actions pane, right-click Play Animation and choose: Test Action.

The front left door of the Entry Vestibule should slide open. Now let's define the Action for the front right door of the Entry Vestibule.

20. In the Scriptor window, in the Scriptor View pane, click Open Right Front Door.

21. In the Actions View pane, click the Play Animation icon, and from the Animation drop-down, expand Opening Front Doors and then select: Front Right Door.

22. Test the Action.

The front right door of the Entry Vestibule should slide open. Now interact with the model by navigating our way through the front doors of the Entry vestibule to see if they will open for us. Before we can do that we must first enable the Scripts that we just created.

23. On the Animation tab, on the Script panel, click the Enable Scripts button ([see Figure 12.2](#)).

FIGURE 12.2

Scripts must be enabled before they can be run If the Navigation Bar is not active in the scene view, on the View tab, on the Navigation Aids panel, click the Navigation Bar button.

24. In the Saved Viewpoints window, click Front Entrance.

25. On the Navigation Bar, click the Walk tool.

26. On the Viewpoint tab, on the Navigate panel, click the Realism drop-down and deselect Collision if it is selected and then click the Realism drop-down to close it.

27. Using the Walk tool, Walk towards the Front Door of the Entry Vestibule until the doors slide open and then release the Walk tool.

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HINT: Do not walk forward too fast or it will appear as if you walked through the doors without the doors opening.

Now let's assume that we changed our mind and decided not to go into the building.

28. With the Walk tool still active Navigate away from the door (basically Walk backwards keeping the Camera on the Front Entrance at all times) and when you see the entire Entry vestibule release the Walk tool.

Notice that the front doors of the Entry Vestibule are still open. If your mother or father were around you would have been informed that you left the front door open and to close the door. Let's do exactly that by adding a Script to close the front doors as we navigate away from them. Before we can add new Scripts we must first disable the Scripts that are running.

29. On the Animation tab, on the Script panel, click the Enable Scripts button to disable the Scripts.

30. In the Saved Viewpoints window, click Front Entrance.
31. In the Scripts View window, right-click on the Entry Vestibule Folder, select Add New Script and then rename the Script to: **Close Left Front Door** and then press ENTER.
32. Repeat to create: **Close Right Front Door**.
33. In the Scriptor window, in the Scriptor View pane, select: Close Left Front Door.
34. In the Scriptor window, below the Events View pane, click the On Hotspot icon.
35. In the Properties View area, leave Hotspot set to: Sphere and then change Trigger when to: Leaving.
36. Click the Pick button. In the Scene View pick the center point at the bottom of the two doors where the two doors come together.
37. In the Properties View area, in the Radius field, type: **6ft** and then click in the Scene View for the value to be accepted.
38. Repeat the process for the Close Right Front Door script.

The events we just created will trigger a Script whenever we navigate outside a 6 foot radius of the doors. Now let's define the Action of the Script.

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39. In the Scriptor window, in the Script View pane, select Close Left Front Door.
40. In the Actions View pane, click the Play Animation icon, and then in the Properties View area, from the Animation drop-down select: Front Left Door.
41. Click the Starting at drop-down and then choose: End.
42. Set the Ending at drop-down to: Start.
43. In the Scriptor window, in the Actions pane, right-click Play Animation and click Test Action.

The front left door of the Entry Vestibule should slide close. Now let's define the same Action for the front right door of the Entry Vestibule.

44. In the Scriptor window, in the Script View pane, click Close Right Front Door and repeat the process. Test the action.

The front right door of the Entry Vestibule should slide close. Now let's interact with the model by navigating away from the front doors of the Entry vestibule to see if they will close for us.

45. On the Animation tab, on the Script panel, click the Enable Scripts button.

46. On the Navigation Bar, click the Walk tool.

47. On the Viewpoint tab, on the Navigate panel, click the Realism drop-down and deselect Collision if it is selected and then click the Realism drop-down to close it.

48. Using the Walk tool, Walk towards the Front Door of the Entry Vestibule until the doors fully open and the camera is just about even with the doors.

HINT: Do not Walk forward too fast or it will appear as if you walked through the doors without the doors opening.

49. With the Walk tool still active Navigate away from the door (basically Walk backwards keeping the Camera on the Front Entrance at all times) and when you see the Entry Vestibule doors fully close release the Walk tool.

Congratulations. You just made your mother or father happy by closing the front door and you just created a Script in Navisworks. If you would like, you can now experiment with the • Visualization •

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other set of doors in the entry Vestibule. Feel free to create Scripts to open and close those doors as well.

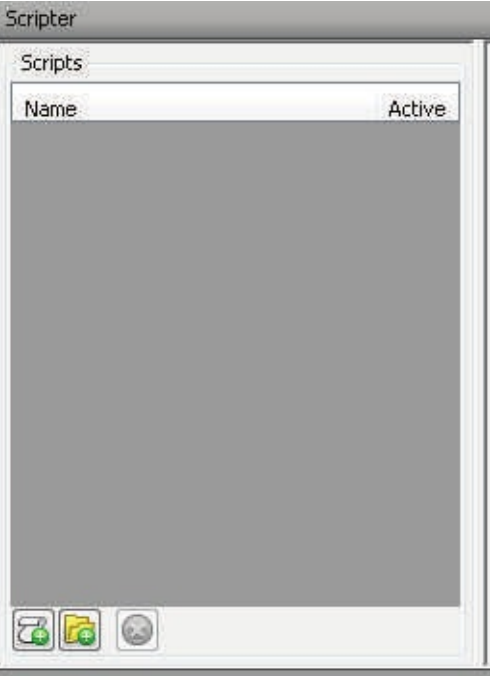
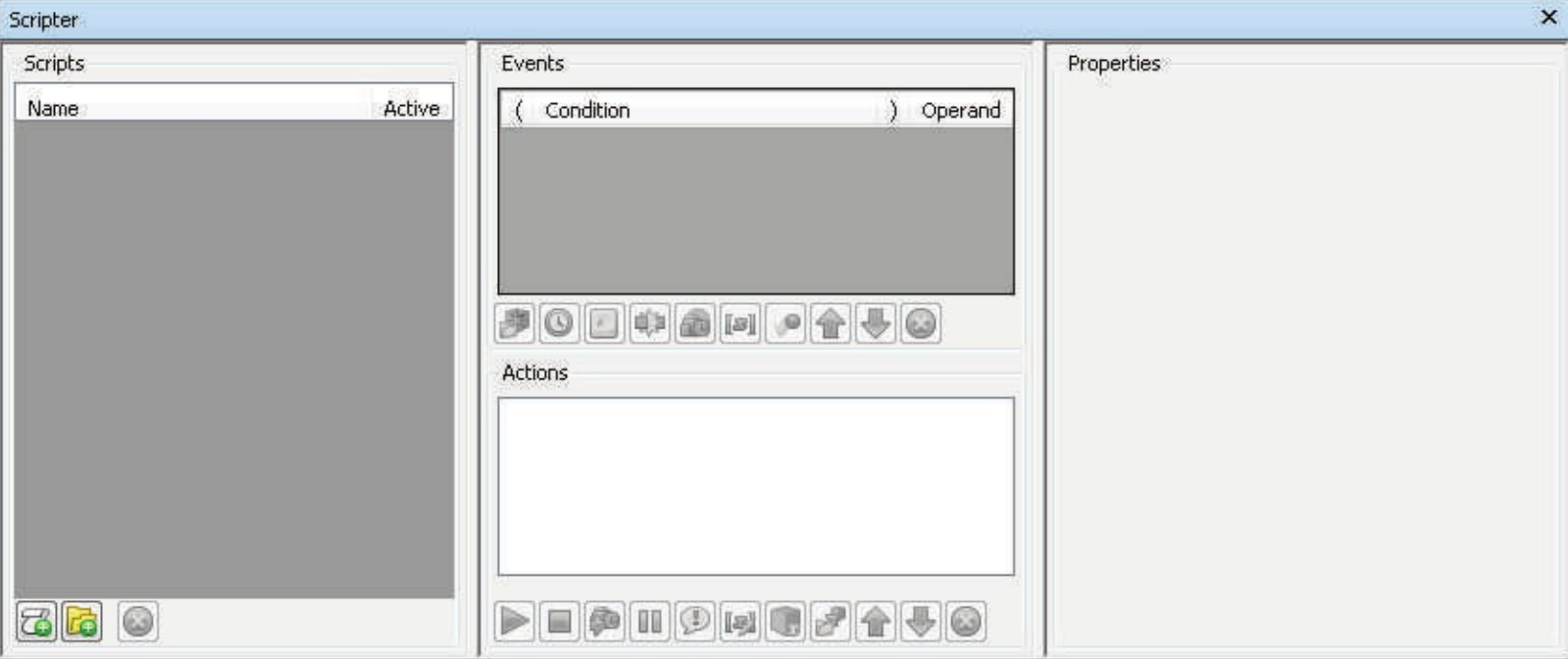
From here, you can apply the concepts that you just learned to your own projects to enhance the interaction with your model as you navigate through it. Please remember that Scripts can only be created from existing Animations in the Navisworks project file.

PREPARE TO CLOSE YOUR PROJECT FILE

If you would like to save the file you were working on herein to return to it later, you can save the project file as another name through the Application Menu with Save As. Otherwise let's close the project file without saving.

50. From the Application Menu, choose: Exit Navisworks.

51. When prompted to save the changes to the project file, click No.



QUICK REFERENCE FOR THE SCRIPTER TOOL

The Scripter tool has several areas. We explored a few in the tutorial above. Here is a complete list for your ongoing reference.

The Scripter tool can be broken down to four distinct parts: the Scripts View pane, the Events View pane, the Actions View pane, and the Properties View area ([see Figure 12.3](#)).

FIGURE 12.3

The Scripter tool

Script View Pane:

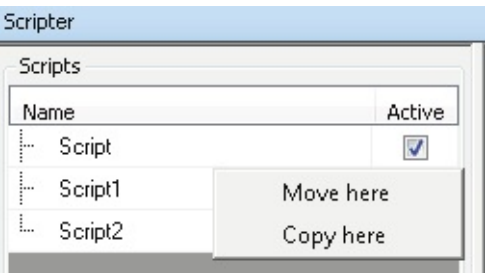
The Scripts View pane displays the available Scripts and helps you manage your Scripts (see [Figure 12.4](#)).

FIGURE 12.4

The Scripts View pane

Scripts and Folders can be added in this pane and appear in the Scripts tree. There are only two options directly below the Script pane that are available when a Script(s) has not been created yet. Those options are:

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Add New Script—This option adds a new Script to the Script View pane.

Add New Folder—This option adds a Script Folder to the Script View pane.

Script Folders only contain Scripts and their sole purpose is to group Scripts together so that the contents of the Folder can easily be expanded or collapsed in an effort to help organize the Script View pane.

After a Script or Folder has been added to the Script View pane, another option becomes available. That option is:

Delete Item—This options deletes the selected item in the Script View pane.

A contextual menu is available when right-clicking in the Script View pane. There are only two options available in the contextual menu. Those options are Add New Script and Add New Folder. Both options have previously been discussed.

Once a Script or Folder has been created, you can right-click on any item of the Script View pane to receive a contextual menu. There are five options available in the contextual menu. Add New Script, Add New Folder, and Delete Item have previously been discussed.

The other two options are:

Rename Item—This option renames the selected item in the Script View pane.

Deactivate or Activate—This option Deactivates an active Script or Folder or Activates an inactive Script or Folder. Only active Scripts or Folders will be executed. When deactivating an entire Folder all the Scripts in that Folder will be inactive.

Within the Script View pane, Scripts and Folders can be moved by dragging the component to a new location. To do this, select the component in the Script tree and once selected right-click and move the component to the position that you would like to place it in the Script tree. Once you begin to move the mouse away from the selected component the mouse pointer will change to an arrow. Once at the new location in the Script tree, release the right mouse button and a contextual menu will be displayed ([see Figure 12.5](#)).

FIGURE 12.5

The contextual menu when moving items in the Scene View pane The options in the contextual menu are:

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Move here—This option moves the selected component in the Scene tree to the new location selected.

Copy here—This option copies the selected component in the Scene tree to the new location selected.

The next pane to discuss is the Events View pane ([see Figure 12.6](#)).

FIGURE 12.6

The Events View pane

An Event is the occurrence of a defined incident or situation. This pane allows you to define the type of Event that will occur. The Events View pane lists the Events for the selected Script, in the Script View pane. Events can be added and existing Events can be moved up or down in the Events View pane. The following options are available in the Events View pane:

On Start—This option will trigger a Script as soon as the Enable Script tool is active. When a file is initially opened, if scripting is enabled, then any On Start Events will be immediately triggered.

On Timer—This option will trigger a Script at pre-defined time intervals.

There are two options for the Regularity of the Event. Those options are: Once After—In the Properties View area, click this option in the Regularity drop-down area to have an Event start after a certain length of time. This Event will only happen once.

Continuous—In the Properties View area, click this option in the Regularity drop-down to have an Event continuously repeat itself at specific points in time. This typically simulates cyclical work.

On Key Press—This option will trigger a Script when a pre-defined Press key is pressed on the keyboard. Key Press options Trigger on: Key Up—In the Properties View area, click this option in the Trigger on drop-down area to have an Event start after you press and release the Press key on the keyboard.

Key Down—In the Properties View area, click this option in the Trigger on drop-down to have an Event start the moment the Press key is released on the keyboard.

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Key Pressed—In the Properties View area, click this option in the Trigger on drop-down to have an Event start while the Press key is pressed on the keyboard.

On Collision—This option will trigger a Script when the mouse pointer collides with a specific item(s). The collision item(s) can be defined as follows:

Selection to collide with—In the Properties View area, click this drop-down to define the item(s) which item(s) will be used. The Set options are as follows:

Clear—In the Properties View area, click this option in the Selection to collide with drop-down to Clear the currently selected collision items.

Set From Current Selection—In the Properties View area, click this option in the Selection to collide with drop-down to set the collision items to the currently selected items in the Scene View.

Set From Current Selection Set—In the Properties View area, click this option in the Selection to collide with drop-down to set the collision items to the currently selected Search or Selection Set.

Show—In the Properties View area, this information box will indicate the number of items selected. Click to Show the item(s) in the current Selection Set in the Scene View.

Include the effects of gravity—Click this checkbox in the Properties View area to have Gravity included as a Collision item.

On Hotspot—This option will trigger a Script when the mouse pointer is within a specified range of the Hotspot. The Hotspot types and when they are triggered are as follows:

Sphere—In the Properties View area, click this option in the Hotspot drop-down to establish a Sphere

around a specified or picked point.

Sphere on selection—In the Properties View area, click this option in the Hotspot drop-down to establish a Sphere around the current selection in the Scene View. Sphere on Selection changes the Position, in the Hotspot Type, to Set The three available Sets are Clear, Set from Current Selection, and Set From Current Selection Set. Those three Sets were previously described in the On Collision discussion topic above. In addition, the Pick... option changes to Show. The Show option was previously described in the On Collision topics discussion above as well.

Entering—In the Properties View area, click this option in the Trigger when drop-down area to start the Event when the mouse pointer crosses into the Hotspot.

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Leaving—In the Properties View area, click this option in the Trigger when drop-down to start the Event when the mouse pointer leaves the Hotspot.

In Range—In the Properties View area, click this option in the Trigger when drop-down to start the Event when you are inside the Hotspot area.

Position—In the Properties View area, enter the X, Y, and Z values for the position of the Hotspot. This field is not available when Sphere on selection has been selected as the Hotspot. See the Sphere on Selection discussion for the available options.

Pick—In the Properties View area, click this option to pick point for the Hotspot. The X, Y, and Z values are automatically updated based on the coordinates of the point selected. This option is not available when the Sphere on selection has been selected as the Hotspot. See the Sphere on Selection discussion for the available options.

Radius—In the Properties View area, enter the radius of the Hotspot.

On Variable—This option will trigger a Script when a variable meets predefined criteria. The following criteria can be defined: **Variable**—In the Properties View area, enter the name of the Variable to be evaluated.

Value—In the Properties View area, enter a value to be tested against the Variable.

Evaluation—In the Properties View area, this drop-down defines the operator used for Variable comparison. The following operators are available in the Evaluation drop-down: Equal to, Not equal to, Greater than, Less than, Greater than or equal to, and Less than or equal to.

On Animation—This option will trigger a Script when a specific Animation starts or stops. The Animation items can be defined as follows: **Animation**—In the Properties View area, this drop-down allows you to select the Animation that triggers the Event.

Trigger on—In the Properties area, this drop-down allows you to select the option that defines how the Event will be triggered.

Starting—An Event is triggered with the Animation starts.

Ending—An Event is triggered with the Animation stops.

Move up—This option moves the selected item up one position in the Event View pane. The Move up option is only available if the selected item can actually Move up one position in the Event View pane. If the selected item cannot Move up one position in the Event View pane nor are there any Events in the Event View pane this option will not be available.

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Move down—This option moves the selected item down one position in the Event View pane. The Move down option is only available if the selected item can actually Move down one position in the Event View pane. If the selected item cannot Move down one position in the Event View pane nor are there any Events in the Event View pane this option will not be available.

Delete Event—This option Deletes the selected Event from the Event View pane.

When there are no Events listed in the Events View pane, a contextual menu is available by right-clicking in the Events View pane. The contextual menu that is available at that point is the Add Event fly out. The Add Event fly out will contain the following options: On Start, On Timer, On Key Press, On Collision, On Hotspot, On Variable, and On Animation.

The descriptions of those Events were previously discussed above.

When one Event is listed in the Events View pane, a different contextual menu is available.

That contextual menu contains four options. Two of those options have previously been discussed. Those options are the Add Event fly out, and the options available on that particular fly out, and Delete Event. The descriptions of those options were previously discussed above. The other two options available in the contextual menu are: Brackets—This option is available but this option is most critical when several Events are used in the same Script and those Events are dependent on each other. In addition to this, when multiple Events are dependent on each other to make the Script successful it becomes important to set the correct operator (AND / OR) in the Operand drop-down in the Events View pane.

Brackets can also work in conjunction with Logic, described below.

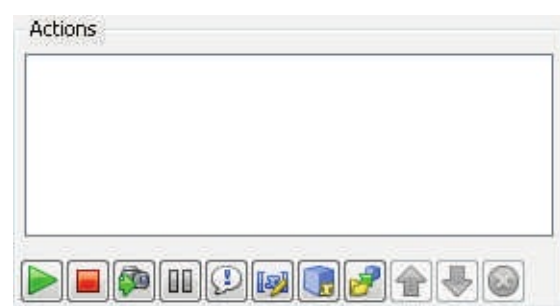
Test Logic—This option will determine if there are any errors in the Logic created (i.e. Open Brackets, etc.).

When more than one Event is listed in the Events View pane, another option, in addition to the four mentioned above, become available. That option is: Logic—This option applies an operator to multiple Events that are dependent on each other to make the Script successful. This is an AND / OR condition and this is also available in the Operand drop-down in the Events View pane.

Logic can also work in conjunction with Brackets, described above.

The next pane to discuss is the Actions View pane ([see Figure 12.7](#)).

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FIGURE 12.7

The contextual menu when moving items in the Scene View pane An Action takes place when triggered by an Event. The Actions View pane lists the Events for the selected Script, in the Script View pane. Actions can be added and existing Actions can be moved up or down in the Actions View pane. The following options are available in the Actions View pane:

Play Animation—This option identifies which Animation will play when a Script is triggered. The following options are available: **Animation**—In the Properties View area, click this drop-down to select the Animation that will play. If Animations do not exist in the Navisworks file, this field will not be available.

Pause at end—In the Properties View area, click this checkbox if you desire for the Animation to stop at the end of the Animation. If this checkbox is cleared, the Animation will return to its starting point when the Animation has ended.

Starting at—In the Properties View area, click this drip-down to define where the Playback of the Animation begins. The following options are available in the drop-down:

Start—The Animation plays forward from beginning of the Animation.

End—The Animation plays backwards from the end of the Animation.

Current Position—The Animation plays from its current position, if the Playback has already started.

Specified Time—The Animation plays from the time specified in the Specific Start Time field.

Specific Start Time (seconds)—In the Properties View area, specify the starting time of the Animation Playback. This field is only active when Specific Time has been selected in the Starting at drop-down.

Specific End Time (seconds)—In the Properties View area, specify the ending time of the Animation Playback. This field is only active when • Visualization •

Specific Time has been selected in both the Starting at drop-down and the Ending at drop-down.

Stop Animation—This option identifies which Animation will stop when a Script is triggered. The following options are available: **Animation**—In the Properties View area, click this drop-down to select the Animation that will stop. If Animations do not exist in the Navisworks file, this field will not be available.

Reset to—In the Properties View area, click this drip-down to select the position of the stopped Animation. The following options are available in the drop-down:

Default Position—The Animation returns to its starting point.

Current Position—The Animation remains at its end point.

Show Viewpoint—This option identifies which Saved Viewpoint to use when a Script is triggered. The following option is available: **Viewpoint**—In the Properties View area, click this drop-down to select the Saved Viewpoint that will be used.

Pause—This option will pause the Script for the time specified, in the Properties View area, before the next Action is executed. Actions are executed one after another in a Script and there is delay between Actions unless a Pause is specified.

Send Message—This option will write a message in at text file when the Script is triggered. The message can be defined in the Properties View area.

The location of the text file is defined in Options > Tools > Scripter.

Set Variable—This option assigns, increases, or decreases a Variable value when the Script is triggered. The following criteria can be defined: **Variable**—In the Properties View area, enter the name of the Variable.

Value—In the Properties View area, enter a value to be assigned to the Variable.

Modifier—In the Properties View area, this drop-down defines the operator for the Variable. The following operators are available in the Modifier drop-down: Set equal to, Increment by, and Decrement by.

Store Property—This option stores item property in a Variable when the Script is triggered. Store Property options are:

Set—In the Properties View area, click this drop-down to define the item(s) which are used to get property from. The Set options are as follows:

Clear—In the Properties View area, click this option in the Selection to get property from to Clear the current selection.

Set From Current Selection—In the Properties View area, click this option in the Selection to get property from drop-down to set the items to the currently selected items in the Scene View.

Set From Current Selection Set—In the Properties View area, click this option in the Selection to get property from drop-down to set the items to the currently selected Search or Selection Set.

Note: If the item(s) selected contains a hierarchy of objects then the top-level object is automatically used for the Property information.

Show—In the Properties View area, this information box will indicate the total number of items selected. Click to Show the item(s) in the current Selection Set in the Scene View.

Variable to set—In the Properties View area, enter the name of the Variable that will receive the property.

Category—In the Properties View area, click this drop-down to display all the property categories available from the selected item(s).

Property—In the Properties View area, click this drop-down to specify the Property type from the selected Category. This drop-down is not available unless a category has been selected and properties exist for the property Category.

Load Model—This option will open the specified file, as defined in the Property View area, when the Script is triggered.

Move up—This option moves the selected item up one position in the Actions View pane. The Move up option is only available if the selected item can actually Move up one position in the Actions View pane. If the selected item cannot Move up one position in the Actions View pane nor are there any Actions in the Action View pane this option will not be available.

Move down—This option moves the selected item down one position in the Actions View pane. The Move down option is only available if the selected item can actually Move down one position in the Actions View pane. If the selected item cannot Move down one position in the Actions View pane nor are there any Actions in the Action View pane this option will not be available.

Delete Event—This option Deletes the selected Action from the Actions View pane.

When there are no Actions listed in the Actions View pane, a contextual menu is available by right-clicking in the Actions View pane. The contextual menu that is available at that point is the Add Action fly out. The Add Action fly out will contain the following options: Play Animation, Stop Animation, Show Animation, Pause, Send Message, Set Variable, • Visualization •

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Store Property, and Load Model. The descriptions of those Actions were previously discussed above.

When one Action is listed in the Actions View pane, a different contextual menu is available. That contextual menu contains three options. Two of those options have previously been discussed. Those

options are the Add Action fly out, and the options available on that particular fly out, and Delete Action. The descriptions of those options were previously discussed above. The other option available in the contextual menu is: Test Action—This option executes the currently selected Action.

Move Up or Move down—This option either moves the selected Action up or down in the Actions View pane. The actual option(s) that will appear in the contextual menu is dependent on the actual position of the selected Action in relation to other Actions in the Action View pane.

Finally, the Properties View area displays the Properties or the options for configuring the selected Event or Action.

SUMMARY

Scripts can be created for existing Animations in a project file. You can assign trigger points, in the form of Events, and define the Actions of the Script once the trigger point was activated.

Scripts can be created to provide interactivity points in the project model.

Events and Actions can be assigned to the Script that will define the trigger for the Script and the Action that will be executed once the Script has been triggered.

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